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CANCER AND TUBERCULOSIS. VIII: A SURVEY OF RECENT WORK ON THE CAUSATION OF CANCER.¹

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By way of introduction it may be explained that the past two years have seen the gradual drawing together of different lines of cancer research in Europe and America which have thrown light on one another and incidentally on some of the points which have emerged from my own work with mice. At the same time the completion of another ten-year period and the publication by the Registrar-General, London, of new details regarding the site distribution of cancer have enabled me to revise and in some respects to complete the analysis of

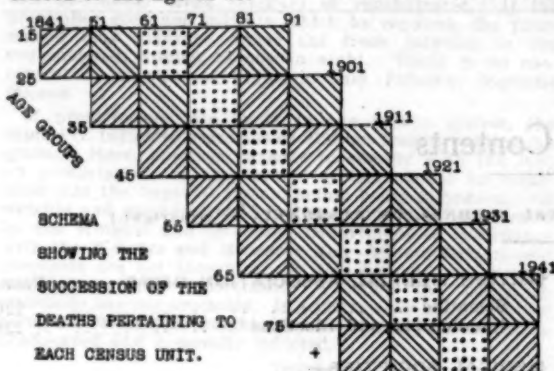
the history of the two diseases in England. It is on deductions from the earlier records that my experimental work on tuberculosis and cancer has been based.⁽¹⁾

PART I: THE STATISTICAL DATA, EXHIBITING THE RELATIONS OF THE TWO DISEASES.

The volumes of the "Statistical Review" for the years 1921-1930 enable me to complete my former study of the relationship of cancer and tuberculosis in a definite section of the community. By taking the young adults in a succession of census periods and following the survivors to old age, the percentage of that section which died of tuberculosis and cancer can be ascertained. I have referred to the mean population aged 15-25 for an intercensal period as a census unit. The first of these is represented by the deaths in the age group 15-25 during the ten years 1841-1850, the survivors of these by the deaths in the age group 25-35 during 1851-1860,

¹ Read at a meeting of the Victorian Branch of the British Medical Association on April 5, 1933.
Publication of the R. J. Fletcher Cancer Research Fund.

and so on, until the survivors form the age group 75 and over in 1901-1910. Four such census units are now practically complete, and the fifth can be traced to the age of 65.



GRAPH A.

The age groups are shown on the left margin. The ten-year periods on the top and right.

Several correlations are known to exist between the numbers of deaths from the two diseases, but these may have been regarded as merely due to chance coincidence, especially as different periods of life are involved in the comparison. The evidence now presented will, I think, go a long way towards demonstrating the causal relationship of the two diseases, and by explaining the reason for such correlations eliminate the element of chance from them.

The Census Units.

Table I contains the data necessary for this purpose. It gives the mean population of the age group 15-25 at the middle of the first ten-year period; the deaths from all causes and from phthisis and cancer arranged in their successive ten-year age groups, and the percentage which the aggregate of these two diseases forms in relation to the sum of the deaths from all causes.

All the numbers in this table are derived from the annual reports and decennial supplements, with two exceptions. First, the deaths from phthisis and cancer, age group 15-25, in the first census unit have been obtained by taking ten times the numbers so registered in 1847, this being the only year for which year age, sex and cause are complete. The information given for London, however, enables us to see that the year 1847 was rather below the average for phthisis at "all ages" (7,010 deaths, against the average for ten years of 7,132). Hence I think that ten times the record of the seventh year is not an over-estimate, especially as the official rate for phthisis shows a very great fall between 1838 and 1850 (from 3,782 to 2,889 per million of the population).

The second exception is the last line of figures for the 1871 census unit, for which a curve for the percentage increase in the numbers for the age group 75 and over exhibited for the past twenty years has been extended for another eight years from the present time to 1940.

TABLE I.
Details of Deaths in the Census Units.

Observation.	Date of Census.			
	1841.	1851.	1861.	1871.
Mean Population, Aged 15-25 ..	3,342,083	3,593,016	3,973,653	4,530,315
Deaths.				
Age Group:				
15-24 ..	273,359	129,460	813	978,439
25-34 ..	278,216	123,117	129,834	307,350
35-44 ..	313,569	123,674	129,043	322,407
45-54 ..	300,611	103,212	98,178	436,476
55-64 ..	499,006	65,318	36,069	456,931
65-74 ..	499,006	38,609	35,255	645,931
75 and over ..	1,744,631	463,120	455,742	2,070,784
Progressive figures ..	1,744,631	463,120	455,742	2,070,784
Age Group:				
15-24 ..	670,102	11,801	11,801	11,801
25-34 ..	681,757	2,212	13,288	11,163
35-44 ..	681,757	2,212	13,288	11,163
45-54 ..	681,757	2,212	13,288	11,163
55-64 ..	681,757	2,212	13,288	11,163
65-74 ..	681,757	2,212	13,288	11,163
75 and over ..	681,757	2,212	13,288	11,163
Total Deaths ..	3,046,540	465,874	470,681	4,314,070
Combined Deaths ..	648,214	732,839	826,011	931,593
Percentage ..	21.46	21.46	21.46	21.46
Rate at age of 65 ..	31.06	30.66	30.67	30.34

The percentages found by dividing the combined by the total deaths in each unit are very nearly equal, and the significance of this fact is all the greater when due weight is allowed to the following considerations. The mean population at the age of 15-25, taken from the respective census returns, is, after allowing for emigration, fairly well accounted for by the deaths recorded. There is no doubt, therefore, that the tables present substantially a true picture of the fate of each successive census unit. No set of numbers belonging to any age group appears twice, so that each unit is independent of the others. The general rise in the population is reflected in the increase of the deaths from all causes by 40% in the 1871 unit compared with that of 1841, while during the same period the deaths from cancer increased by 170%. Phthisis reached a maximum in the 1851 unit, but no great reduction can be seen for another twenty years. Meanwhile the average age constitution of the population was increasing and the proportion of males diminishing. In the course of this hundred years nearly the whole of the increase in population has gone to increase the size of the cities, and the general average of food supply and conditions of life have steadily risen. Yet in face of these complicating factors the percentage of the population falling victims to the two diseases is practically unchanged and a new sidelight is thrown on the social history of the English people. It begins in 1841 and is traceable to 1940.

Phthisis Being Replaced by Cancer.

The figures for the census units disclose the complete life history of the mean population with which each unit began. That is, we have here proof that four distinct and entirely unconnected sections of the population, except that the fourth and fifth units must have been mainly the children of the first and second, died of one or other of the diseases in the same proportion; but with this difference, that as the one disease became less common the other advanced so as to secure a much larger part of the 22%, but up to the present time the combined total has never exceeded that amount. The steps of the process by which this result has been brought about are the following: At the close of the first ten-year period the proportion of the combined deaths to deaths from all causes ranges from 47.7% to 39.1%, the difference being due to the rapid reduction of phthisis. During the subsequent twenty years the percentages begin to converge, and this movement becomes more marked in each successive ten-year period until at the age of 65, the point marked in the table by the line "Progressive Figures", they have become very nearly equal. This coincidence makes it possible to introduce the census unit for 1881, which can be traced to this stage, where it falls in line with its predecessors.

Strong confirmatory evidence of the reality of the final 21.5 percentage is afforded by the behaviour of this 1881 unit. Even if it were probable that the percentages in the first four instances were

very close together by chance, it is improbable that the fifth would also by chance exhibit the same result.

In records dealing with several phases of human activities it is surprising that the results should be so nearly identical. But as an unknown proportion of the certificates of death will certainly have contained mistakes in diagnosis, it is necessary to consider this fact. Absolute accuracy is not essential to the solution of the problem, but merely a uniform average standard of approximation to the real facts. The question therefore is, what would happen to the percentage rates if all the numbers could be corrected so as to bring the diagnosis in the earlier periods under investigation up to the standard of accuracy of the present day? This is simplified by the following considerations. The large numbers for phthisis are found in the age groups 15-45, and as the disease at these ages is generally marked by its typical symptoms, the error is probably not great. But after the age of fifty-five a difference can be traced in the annual reports, owing to the discovery of the bacillus changing the diagnosis from bronchitis or bronchopneumonia to tuberculosis. I estimated that 10% should be added to the deaths from phthisis in the age groups above fifty-five years in records earlier than 1900. In the case of cancer the larger numbers are found during the last thirty years, when they require little correction. But in the earlier years many cases which were probably cancer of the colon or rectum were certified as intestinal obstruction. By an analysis of the numbers returned under this heading since 1871 I showed in my third paper⁽¹⁾ that the probable additions required to bring the old diagnosis up to our present standard was 20% in reports earlier than 1880, 12.5% for the period 1881-1890, and 4% for 1891-1900.

Accidents and wounds of war require to be deducted from the deaths from "all causes", differing in this respect from loss by emigration, because the deaths would go to swell the total from all causes, while the one-in-five chance of the person dying of either phthisis or cancer would be lost. Suicide is regarded as a disease, not as an accident.

Applying the corrections for diagnosis and accident to the crude figures, the resulting alterations in the percentage rates are as set out in Table II.

TABLE II.
Corrections to Crude Numbers.

Unit.	Add for Diagnosis.		New Rate.	Subtract for Accidents.	Final Rate.
	Phthisis.	Cancer.			
1841	3,649	16,105	21.67	100,331	22.39
1851	3,367	11,538	21.90	107,801	22.62
1861		5,354	21.75	116,459	22.37
1871		1,793	21.63	122,861	22.27

Whether the crude figures be chosen or one or both of the corrections be introduced, the resulting percentages are so close together that they will appear to many minds to establish the relationship

of the two diseases. The cardinal fact is that in England nearly one-fourth of all adults die of one or other of the two diseases, and that ever since certificates of death were introduced, more than ninety years ago, cancer has been steadily taking the leavings of phthisis, but the combined deaths have never reached 23%.

The Resulting Correlations.

As a consequence of this fundamental condition there are two correlations which have been known for several years. In the first place the sum of the combined death rates at all ages has remained nearly constant for more than thirty years, the increase in the cancer rate balancing the reduction in that of phthisis. Examples are seen in Table III.

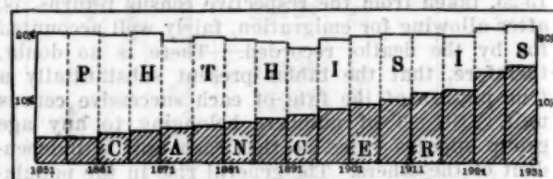
TABLE III.
Compensating Effect on Death Rates.

Period.	England. (Per Million.)			Australia. (Per One Hundred Thousand.)		
	Phthisis.	Cancer.	Com- bined.	Tuber- culosis.	Cancer.	Com- bined.
1891-1895	1,461	712	2,173			
1896-1900	1,323	800	2,123			
1901-1905	1,218	867	2,085	89	63	152
1906-1910	1,106	939	2,045	75	70	145
1911-1915	1,046	1,054	2,100	77	75	152
1916-1920	1,104	1,179	2,283	71	83	154
1921-1925	857	1,399	2,126	62	91	153
1926-1930	770	1,411	2,181	53	97	150

These are the crude rates, that is, the numbers derived from the actual deaths and population at each successive period. The only break in the series is the war period in the English rates. The explanation of the correlation is to be found in the preponderating influence of the census units at any given period. An inspection of Table I shows that in the 1841 unit the deaths from phthisis and cancer were in the proportion of five to three, while in that for 1871 the proportion was 6.3 to 7, but as the combined deaths constituted a regular percentage of the population, the increase of cancer compensated for the reduction in phthisis. From these facts it is clear that the influence of the population above the age of fifteen must make these rates nearly balance each other. At the census of 1931 there were 12.5 millions below 15, and 27.5 above that age. Hence the great preponderance of those that come under the regimen of the census units maintains the rate at a nearly constant level. A causal relationship between the two diseases might be suspected, but could not be proved from this correlation of the death rates. But with the census units as a guide there is no difficulty in seeing why this correlation exists.

The second correlation is the 20% ratio. In 1925 I drew attention to the fact that phthisis and cancer combined have caused a nearly uniform proportion of all deaths above the age of twenty-five years since 1851. If the recorded deaths are corrected in the way suggested for the census units and accidents deducted from "all causes", the average as shown on the graph is about 20.5.

The explanation of this correlation is found by an analysis of the census units. The proportion dying of the two diseases from the age of fifteen onwards is 22.5%, and if the calculation is made from the age of twenty-five, after including the corrections



GRAPH B.
The twenty per centum ratio. The combined deaths from the two diseases in five-year periods have averaged 20% since 1851.

for diagnosis and accidents, the four results are: 1841, 19.73; 1851, 20.35; 1861, 20.32; 1871, 20.75. This calculation shows that facts analogous to those established for the census units apply to the population as a whole, the two diseases regularly causing the death of one adult in every five, the increase in cancer almost exactly compensating for the reduction in phthisis; in other words, the adult population consists of a regular series of census units.

Calculated with the same corrections, the corresponding ratio for Scotland since 1871 is 19.3. The percentages for the past ten years vary from 18.1 in 1921 to 19.8 in 1926, the smaller population making the rates for single years somewhat more erratic.

In calculating any such ratio, as the divisor is the total of the deaths from all causes, any unusual experience, such as influenza or a succession of severe winters, may greatly increase the size of the divisor, and, as the cancer deaths are not much influenced by the same conditions, the ratio will be reduced. Thus for 1929, an unusually severe year, it was 19.31 for England, as compared with 20.7 for 1931. For Australia in 1931 it was 20.6.

The Increase of Cancer is a Fact.

The relationship between the two diseases thus disclosed by the census units throws light on another question which is often discussed in current literature. They show that the apparent increase of cancer is mainly a real increase, and not due to such secondary factors as the improvement in medical diagnosis and the ageing of the population. The gradual replacement of the deaths from phthisis by those from cancer involves as the primary condition the increase of the one disease and the reduction of the other. The figures in Table I show that this would have been the case even if the population had remained stationary. Between 1841 and 1880 the increase in the deaths from all causes owing to the growth of the population was 39.8%, while the increase in cancer among these deaths was 170%, or more than four times the increase *pro rata* with that of the population. Again, the proportion of the older age groups which dies of cancer

is always increasing, as is seen by the comparative figures for the past three decades (Table IV).

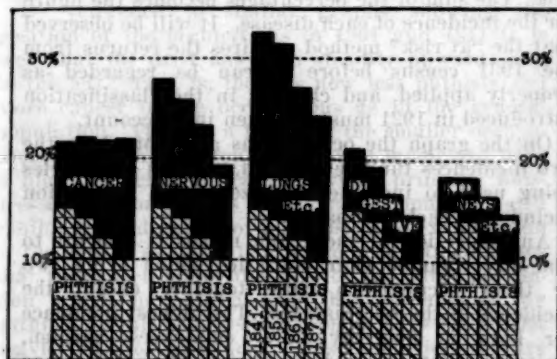
TABLE IV.
Cancer as a Percentage of Total Deaths, Minus Accidents.

Period.	Age Groups.			
	45-55.	55-65.	65-75.	75 and over.
1901-1910 ..	14.17	15.20	11.53	5.61
1911-1920 ..	16.28	17.99	13.65	6.84
1921-1930 ..	19.25	21.67	17.11	8.64

Now the increase in the percentages for the first three of these age groups may be explained on the theory that between 45 and 75 all the other causes of death are receding while cancer holds its own. This would account for the increase in the cancer incidence and also for the much larger numbers that now enter the oldest age group. But from this age group there is no escape, and if there is no real increase in cancer the percentage should remain constant whether the total deaths are a thousand or a million; whereas in the period under review it has increased by 54%, while the standardized mortality rate for cancer in this age group has increased during the same period from 789 to 1,303, that is, 65%.

The Relationship is Specific.

The combined deaths from phthisis and cancer present a unique phenomenon in the history of the census units. This may be shown by superimposing in succession the corresponding incidence of the deaths returned under each of the principal systems—nervous, respiratory, digestive and urinary—upon the graph for the deaths from phthisis. The graph for phthisis and cancer has a unique character because the balancing of the



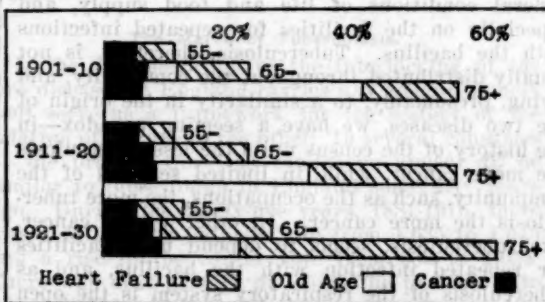
GRAPH C.

Unique relationship of cancer and phthisis. The hatched base of each figure is the proportion of the deaths from all causes that has been caused by phthisis in each census unit. The black cap is the corresponding proportion of the diseases as named.

deaths from these two causes makes the upper margin nearly a straight line at 21.4%. But the combination of each of the others with phthisis results in a different picture, because in these the

incidence has in the aggregate declined from 39% to 32% of the deaths from all causes. The combined graphs therefore present a series of steps similar to the picture produced by phthisis alone. A slight increase has taken place in the deaths assigned to the urinary system, but this is in no way comparable with the regular increase assigned to cancer.

On the whole it may be said that the deaths from these four groups, representing about one-third of the total deaths, have maintained a very constant proportion to the increase in the total deaths, which has been brought about by the steady increase in the adult population of England. On the other hand, during the past twenty years there has been a very marked increase in the deaths from the heart and vascular system at all ages over sixty-five years. This is due entirely to the gradual reduction of the number returned as "old age", and replacement of these by various forms of heart failure, as may be seen in Graph D. This interchange has not in any way affected the incidence of cancer. The great increase in the numbers of both sexes who are surviving the traditional three score years and ten, is reflected in the corresponding increase in the deaths from cancer. But during the same period of time the caption "old age" has been greatly reduced. It was formerly large and indefinite and was supposed to cover many cases of unrecognized cancer. It has now been explored without in any way disturbing the uniform curve of cancer increase.



GRAPH D.

"Heart Failure" replacing "Old Age" after the age of 65.

In the case of a country in which the increment is mainly by natural increase not complicated to any great extent by immigration, the advantage of the study of a definite isolated group of the population, such as these census units, is obvious. They are homogeneous, self-contained sections of the population, and age and sex variations are eliminated. All the individuals passed their childhood under the same average conditions and march on as a solidarity from the age of fifteen to the grave. As a consequence, when the exact numbers are known by the death of the last survivors, these units may be analysed for the incidence of each disease by the method of the numbers at risk. Calculated in this way, cancer is shown to be uniformly progressive from the earliest times.

TABLE V.
Cancer in the Census Units.

Age Period.	Percentage against Number at Risk.			
	1841.	1851.	1861.	1871.
35-45	0.44	0.53	0.58	0.64
45-55	1.21	1.49	1.74	1.89
55-65	2.52	3.21	3.70	4.00
65-75	4.34	5.41	6.16	7.03
75 and over ..	5.80	6.84	8.64	(10.15)

The census units are independent of the fluctuating numbers of the population of all ages with which they are surrounded. This table therefore has no direct reference to the mortality rates, and it is questionable if the mortality rates can reveal the facts thus set out.

The Occupations and Cancer.

The occupations were dealt with in my early papers in which it was shown that the incidence of phthisis in 1891 ran parallel with the incidence of cancer in 1911. The returns for the census of 1921 are now available and enable me to extend this line of investigation.

A preliminary note must, however, be made of a new aspect of the problem. In the census units it appears that when the population is taken as a whole, the one disease increases as the other diminishes, yet it is certain that in every community the incidence of tuberculosis depends upon the general conditions of life and food supply, and especially on the facilities for repeated infections with the bacillus. Tuberculosis, therefore, is not equally distributed throughout the community, and owing, presumably, to a similarity in the origin of the two diseases, we have a seeming paradox—in the history of the census units the less tuberculosis the more cancer, while in limited sections of the community, such as the occupations, the more tuberculosis the more cancer. In other words, cancer, like tuberculosis, seems to depend upon facilities for repeated infection with the bacillus, and as tuberculosis of the respiratory system is the open form providing the chief means of disseminating the bacillus, it follows that the correlation of cancer with phthisis is closer than with tuberculosis in all its forms.

In my second and third papers an approximation to the relation of the two diseases was made by calculating the incidence of phthisis in 1891 and that of cancer in 1911, the interval of twenty years allowing the survivors of the earlier census to reach the cancer age. The 395,000 deaths were divided into five groups, the first including all occupations with less than 9% of phthisis and the fifth those with more than 21%. The three intermediate groups were arranged to contain, as near as might be, 100,000 deaths each. When the cancer rates are calculated in ten-year age groups they form nearly a perfect sequence similar to that exhibited by the census units in Table V.

That these results are controlled by no other recognizable common feature except the incidence of phthisis is fairly evident when the total number of deaths and the six largest occupations in each group are placed together.

A.—61,381 deaths. Farmers, farm workmen, gardeners, clergy, plate-layers, brickmakers.

B.—101,034 deaths. Coal miners, shoemakers, carpenters, iron trades, innkeepers, blacksmiths.

C.—102,064 deaths. Labourers, carters, seamen, cotton trades, tailors, butchers.

D.—97,375 deaths. Engineers and boilermakers, masons and quarrymen, painters, wharf labourers, costermongers, watchmen and messengers.

E.—33,886 deaths. Clerks, railway porters, printers, hotel employees, drapers, brass workers.

TABLE VI.
Phthisis the Indicator of Cancer.

Group.	Phthisis Index, 1891.	Cancer Incidence, 1911, at Age Periods.					
		25-34.	35-44.	45-54.	55-64.	65-74.	75 and over.
A ..	3-9	11.7	44	139	347	573	610
B ..	10-14.9	19.3	69	233	468	650	553
C ..	15-16.4	19.8	77	249	492	655	561
D ..	16.5-21	21.1	73	269	543	735	637
E ..	Over 21	33.6	113	337	578	809	677

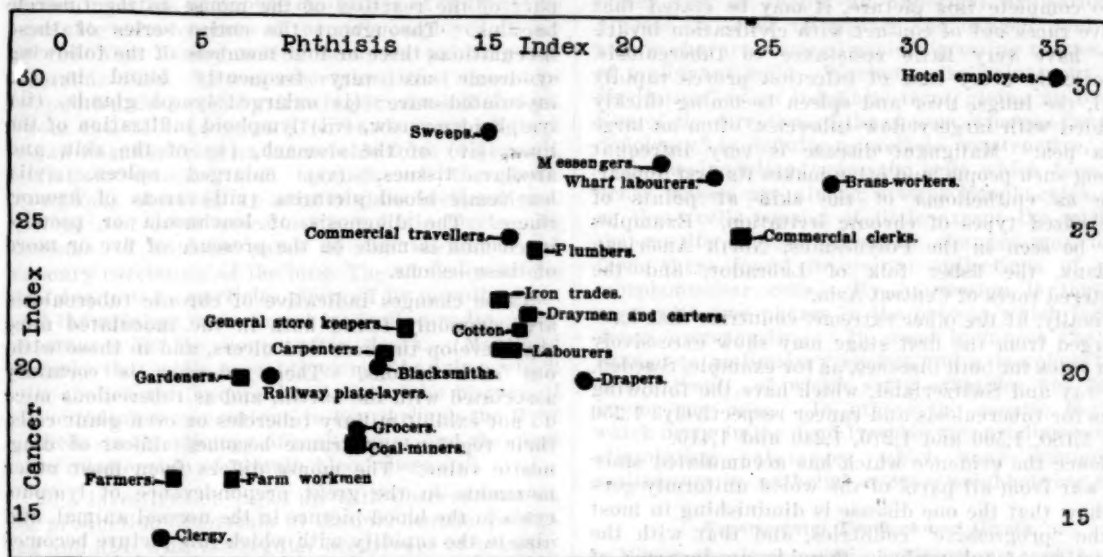
The material available for an analysis of the deaths in the occupations begins at the census of 1891. I have arranged the deaths in a given occupation by taking the age group 25-35 from 1891, 35-45 from 1901, 45-55 from 1911, and two groups, 55-65 and 65 and over, from 1921. The numbers for each occupation are standardized for the four census periods and the percentage for the two diseases calculated for each age group as on the numbers at risk. The sum of the percentages becomes the figure for the incidence of each disease. It will be observed that the "at risk" method requires the returns from the 1931 census before it can be regarded as properly applied, and changes in the classification introduced in 1921 must be taken into account.

On the graph the occupations are plotted by the two incidences thus determined, squares and circles being used to indicate the size of the population included in each occupation.

An inspection of the graph makes it difficult to find any common characteristics which bring two or three occupations close together except the incidence of the two diseases. The highest incidence for both is held by hotel employees—barmen, waiters, cellar-men and hostlers. This group has long been recognized as being very prone to tuberculosis, because alcohol in excess always paves the way for that disease. But the high cancer rate is produced by the small proportion of these men who reach the cancer age, the remnants of an occupation decimated by phthisis. Clerks, messengers, and wharf and dock labourers are close together on the graph, although in physical type and mode of life they are far apart; but a similar incidence of

phthisis is associated with a similar incidence of cancer. Near the centre of the graph the great body of the occupations fall into two groups—those with the higher incidence of cancer, commercial travellers, plumbers, iron trades, including engineering and shipbuilding, and drivers of horse-drawn

all cases and cancer in most instances depend on a common factor which may therefore be an invasion by the bacillus for both diseases. The evidence that facility of infection is of great importance in the incidence of the two diseases is confirmed by a world survey of the double problem.



GRAPH E.

The occupations arranged by the incidence of phthisis and cancer. The squares have more than 8,000, circles have 3,000-8,000 deaths.

vehicles; and those with a lower incidence, gardeners, platelayers, carpenters, blacksmiths, unskilled labourers and drapers. At the base of the graph with least of both diseases are coal miners, grocers, farmers, farm workmen and the clergy.

By reference to similar graphs showing the position of the occupations in 1901 and 1911 it is seen that the drift has been steadily upwards and to the left. That is, there is now less phthisis and more cancer in the occupations as in the general population. There is a fringe of the smaller occupations of which chimney sweeps and musicians have a high incidence of cancer, while printers, hairdressers, tobacconists and costermongers still exhibit the old excess of phthisis. The examination of the details as indicated by the occupations shows that those sections of the 22% of the adult population which have been most heavily affected by phthisis are also the sections which have been most heavily affected by cancer. This conclusion appears to be inevitable, provided the use of the "method at risk" is justifiable.

The analysis of the census units showed that the actual numbers of persons dying of each disease interlock in such a way that cancer, occurring later in life, seems to be almost strictly limited to the leavings of phthisis. The analysis of the incidence of the two diseases in the occupations tends to show that the conditions under which the two diseases arise are practically identical. That is, phthisis in

The March of Tuberculosis.

If the demonstration of the interlocking of the two diseases in England carries any weight, it may well serve as a framework for the history of the relation of the one to the other. In several countries at the present time the conditions appear to be similar to those found in England some fifty years ago. During the thirty-five years, 1881-1916, there was a fall in the phthisis rate from 1,635 to 1,046 and a rise in the cancer rate from 632 to 1,054. There was next a stage at which the phthisis rate fell well below 1,000 and the cancer rate steadily rose until it has reached 1,460. The experience of the countries shown in Table VII falls in line with this scheme.

TABLE VII.
Recent Mortality Rates per Million.

Country.	Early Stage.		Country.	Second Stage.	
	Tuber- culosis.	Cancer.		Tuber- culosis.	Cancer.
Finland ..	2,700	750	Scotland ..	880	1,460
Japan ..	1,860	700	England ..	940	1,450
Spain ..	1,350	700	Denmark ..	740	1,440
France ..	1,650	950	Germany ..	780	1,310
Greece ..	1,510	280	Holland ..	750	1,230
Italy ..	1,110	700			

The third stage exhibiting a low tuberculosis rate and a low but rising cancer rate is found in the Australian States, New Zealand, the white popula-

tion of South Africa and parts of the United States of America. The three former have rates for tuberculosis respectively of 490, 430 and 450, and for cancer of 1,010, 1,030 and 770. Queensland, with tuberculosis at 370 and cancer at 920, is as favourably situated as any part of the world.

To complete this picture, it may be stated that native races out of contact with civilization invariably have very little resistance to tuberculosis. Practically every case of infection proves rapidly fatal, the lungs, liver and spleen becoming thickly studded with large yellow tubercles, often as large as a pea. Malignant disease is very infrequent among such people, and often makes its first appearance as epithelioma of the skin at points of specialized types of chronic irritation. Examples may be seen in the Polynesians, North American Indians, the fisher folk of Labrador, and the scattered races of Central Asia.

Finally, at the other extreme, countries that have emerged from the first stage may show excessively high rates for both diseases, as for example, Sweden, Norway and Switzerland, which have the following rates for tuberculosis and cancer respectively: 1,250 and 1,180, 1,500 and 1,270, 1,240 and 1,410.

Hence the evidence which has accumulated since the war from all parts of the world uniformly goes to show that the one disease is diminishing in most of the "progressive" countries, and that with the reduction of tuberculosis there is an increase of cancer. But, judging from the English, Scotch and many similar records, there is no limit in sight to the advance of cancer, as larger proportions of the population become resistant to ordinary doses of tubercle bacilli and the avenues of infection remain open. The striking relationship which exists between the recorded deaths of the two diseases merits a study of the results of experimental work which may be expected to demonstrate a similar correlation between tuberculosis and cancer in animals. The evidence from the occupations that reinfection with tubercle bacilli may be the beginning of the change to malignant disease calls for a survey of the material derived from human sources.

PART II: THE EXPERIMENTAL DATA, DEALING CHIEFLY WITH THE LYMPHOCYTES.

Fresh light has been thrown on a number of points raised in my earlier papers by workers in allied aspects of the cancer problem. In order to test my theory that cancer is caused by a fresh invasion of the tubercle bacillus in persons who have become hyper-resistant to that organism, I have now examined in detail over 600 mice inoculated with very small doses of virulent tubercle bacilli, and the results have been checked by examination in the same detail of an equal number of control mice of the same strain. The description of the method used and the results obtained appears in the fourth, fifth and sixth papers of this series. The points now selected for discussion, in view of recent advances, will be grouped under three headings: the lymphoid system, tumours and ulcers found in the alimentary canal.

The Lymphoid System.

Among the first hundred mice there were three examples of tuberculoma, and acid-fast bacilli were found in seven others. The bacilli were associated with an intense infiltration of certain tissues with lymphocytes, and a lymphocytosis is known to be part of the reaction of the mouse to the tubercle bacillus. Throughout the entire series of these inoculations three or four members of the following syndrome are very frequently found in the inoculated mice: (i) enlarged lymph glands, (ii) lymphoid marrow, (iii) lymphoid infiltration of the liver, (iv) of the stomach, (v) of the skin and areolar tissues, (vi) enlarged spleen, (vii) leucæmic blood pictures, (viii) areas of hæmorrhage. The diagnosis of leucæmia or pseudo-leucæmia is made on the presence of five or more of these lesions.

These changes indicative of chronic tuberculosis are commonly found both in the inoculated mice that develop tumours and ulcers, and in those without such lesions. Their presence is certainly associated with the bacilli, and as tuberculous mice do not exhibit miliary tubercles or even giant cells, their regular appearance becomes almost of diagnostic value. The mouse differs from most other mammals in the great preponderance of lymphocytes in the blood picture in the normal animal, and also in the rapidity with which this picture becomes changed, apparently without any definite reason. It is not by any means so stable as the corresponding phenomenon in man. But while it is not safe to stress the minor changes in the blood, yet the presence of most of the members of the syndrome in unmistakable array admits of no other diagnosis than "lymphatic leucæmia" in one of its forms. Sometimes nearly all the organs and tissues of the mouse are affected.

Lymphocytic Infiltration Leading to Lymphatic Leucæmia.

Prior to 1929, when my fourth paper was published, an important contribution by Simonds had appeared on the histology of leucæmia, pseudo-leucæmia and allied conditions in mice.⁽²⁾ He concluded that these morbid processes were similar in their essential pathology and probably of a neoplastic character. This, however, was uncertain, as attempts to transmit the disease by inoculation had uniformly failed in all animals except fowls. Since that time leucæmia has been transmitted in guinea-pigs as well as mice, and Korteweg has produced leucæmia by injecting the emulsion of a lymphosarcoma, a terminal leucæmic blood picture being commonly found. Firth and Strumia⁽³⁾ obtained in three strains of mice spontaneous enlarged glands which reproduced the disease by inoculation. They conclude that leucæmia and aleucæmic lymphadenosis are essentially the same condition which in mammals is a neoplastic disease.

These results confirm my provisional conclusion that the lymphoid changes following inoculations with tubercle bacilli are related to leucæmia and

pseudoleuchæmia on the one hand and to lymphosarcoma on the other. My observations on these experimental results may with great probability be extended to similar conditions in man by the remarkable series of deaths from anæmia and sarcoma observed by Martland.⁽⁴⁾ These were caused by the ingestion of minute quantities of radio-active insoluble salts by some of the girls employed at one of the New Jersey watch factories painting the luminous dials. It was ascertained that these had all pointed the brush by drawing it across their lips. From two to four years afterwards some of them began to suffer from an intractable form of anæmia, radiation osteitis and necrosis of the jaws. Symptoms observed at a later date included pernicious and other anæmias, lymphatic leuchæmia, sarcoma of various parts of the skeleton, and primary carcinoma of the lung. The whole syndrome was due to the particles given off by mesothorium, and the aetiology was proved by finding radio-active substances in the bones after death. Martland remarks that while precautions may be taken which will abolish this occupational risk, "the history of the outbreak may continue to live through the light it sheds on the etiology of malignancy and the close inter-relationship of certain blood diseases".

This investigation links up with observations on the production of anæmia by chronic benzene poisoning and also with the regular occurrence of primary carcinoma of the lung in the cobalt miners at Schneeberg, Saxony, the ore containing radio-active substances. In records ever since the year 1500 the symptoms of lung disease have been noted, a large proportion of the miners dying in mid-life. Of 21 deaths of the miners in three and a half years, 1921-1924, autopsy proved thirteen to be due to cancer of the lung. Of 362 other deaths in men of the same district not employed in the mines, there was not a single case of cancer of the lung.⁽⁴⁾ It was formerly called sarcoma, but is now known to be a primary, small, undifferentiated cell carcinoma. This change in histological diagnosis corresponds with the general view now widely adopted regarding most tumours of the lung. It is well illustrated by one of my mice, in which a primary carcinoma of the lung can be traced in the one microscopic section to an undifferentiated "round" cell growth by extension in the glands at the bifurcation of the trachea.

Dense Masses of Lymphocytes.

These appear in a very large proportion of the inoculated mice in the form of enlarged lymph glands, lymphoid bone marrow and less regular areas in the liver, kidney, subcutaneous tissue and wall of the alimentary canal. The number of examples found in the marrow is due to the method of examination adopted. As many of the mice were inoculated between the scapulae, the resultant tissue changes could be followed in a transverse section of the thorax, which is decalcified for this purpose. The ribs, sternum and scapula are favourite sites of the change.

The overcrowded collections of lymphocytes would appear to offer ideal conditions for the development of the special type of metabolism characteristic of cells deprived of their normal supply of oxygen, as established by the work of Warburg. When a cell is deprived of oxygen, it either dies or adopts an abnormal utilization of glucose in order to replace the oxygen, and this step is characteristic of rapidly growing tissues and of malignant cells. Warburg also points out that "irritation" is an indefinite term, giving no indication of the direction of the change, whereas "oxygen deficiency" is definite as well as constructive.

In the inoculated mice the cells which form the dense masses are almost always lymphocytes, and as these cells consist of little except the nucleus, the results of their autolytic changes may differ from those found in similar collections of polymorphonuclear cells. My impression is that we meet with two phases in the process which follows dense overcrowding. In some instances the full change to malignancy ensues and a lymphocytoma is the result, of which sixty examples are found among my mice. In others the aseptic changes which occur in the dead lymphocytes produce growth stimulating substances which may inaugurate malignancy in epithelial or other neighbouring cells.

Experimental Tumours and Ulcers.

While the lymphocytic infiltrations may be the most obvious effect of the inoculations with tubercle bacilli, there is also a very marked increase in the incidence of tumours, and a new feature in experimental pathology has been introduced by the regular appearance of ulcers near the pylorus. Many of the tumours and ulcers are intimately associated with the lymphocytic phenomena, and my present object is not to elaborate the descriptions given in previous papers, but to show that the lesions found in the mice fit in well with the general drift of the advances made in other aspects of the cancer problem.

Sarcomata are frequently found in the mediastinum and gastro-splenic regions, and as these are usually lymphosarcoma or lymphocytoma, they appear to be a natural sequel to the abnormal activity of the lymphocytes. Other sites have yielded specimens of most of the types found in human beings, several of them being connected with the skeleton. One spindle-cell sarcoma proved to be transplantable, and tubercle bacilli were recovered from another by inoculation into guinea-pigs. A considerable range of both innocent and malignant epithelial tumours has also been found. Unlike the spontaneous cancer of the mouse, my results have affected many regions besides the mamma, and some are examples which are rare or perhaps hitherto undescribed in the mouse. Among these are papilloma of the bladder, duct carcinoma of the pancreas with secondary deposits in a lymph gland, and an adenoma of the prostate. The question now arises, can the lymphocytes and through them the tubercle bacilli be connected with these epithelial

tumours as definitely as with the sarcomata? Several examples of epithelioma of the skin and carcinoma of the mamma arose near the point of inoculation, and many of the carcinomatous mice exhibited five or six lesions of the lymphoid syndrome. If leucæmia were regularly found with cancers in man the significance of the lymphocytes might be granted, but Martland's cases are the first to show unequivocally that the two conditions are connected. Malignant lymphoid tumours are comparatively rare in man as compared with the numbers of epithelial cancers. While the polymorphonuclear cell is mobilized by the typical septic organisms the lymphocytes appear in response to a mild irritant, such as an aseptic foreign body, and in certain infective diseases, such as smallpox, typhoid fever, syphilis and tuberculosis. They also appear in the deeper layers of the skin in mild burns, in X ray dermatitis, around a lupus ulcer, and frequently, but not as a regular histological feature, in the tissues of malignant tumours, of which the breast and prostate and many epitheliomata of the skin, lip and tongue are examples. Such masses of lymphocytes often present signs of degeneration. The activities of the polymorphonuclear cells and lymphocytes must be clearly distinguished. Cancer stimuli may pass at first through a stage which is usually called inflammatory, with increased cell division and, in the case of epithelial structures, with deformation of the normal appearances. It is something different from hypertrophy, and this early stage develops in a different way from the path followed by products of polymorphic inflammation, as seen, for instance, in the wall of an abscess.

The Lymphocyte and Malignant Disease.

In my sixth paper I described the observations on the rôle of the two varieties of white blood corpuscles in the peritoneal tissues near the pylorus. I concluded that the lymphocytes are factors in the development of malignant disease, while the polymorphonuclear cells lead to suppuration with organization and fibrosis. Two parallel series of infiltrations of the gastro-splenic region, both leading to adhesions and ulcers of the pylorus, were under observation. The one was caused by the tubercle bacilli with which the mice had been inoculated, the other by a spontaneous epidemic due to an organism akin to *pseudotuberculosis muris*, which causes a chronic polymorphic reaction. The lesions could not be distinguished by the naked eye, but under the microscope the difference was at once seen. Epithelial structures involved in the adhesion, such as the gastric glands or lobules of the pancreas, proliferate when surrounded by lymphocytes; but when surrounded by the plasma cells which follow in the wake of the polymorphonuclear cells, they become separated from each other and gradually disappear as the adhesion becomes organized. I concluded that the lymphocytes take an active share in the production of malignant disease and are an essential link between the normal and malignant cell.

The details of tar and other irritants on the skin of mice and rabbits indicate that the process begins as an acute dermatitis with a polymorphic reaction and great hyperæmia. This is followed by the replacement of the polymorphonuclear cells by lymphocytes as the hyperæmia passes away, and in the subsequent changes to fibroid thickening the surface epithelium becomes heaped up and loses the regular contour of its deeper layers. The hair follicles and sebaceous glands to a great extent atrophy and disappear, but isolated remnants of them may assume atypical appearances, often with signs of active proliferation of the epithelium. On the surface of such an area, if the condition becomes progressive, the next step is the appearance of a crop of papillæ not in contact, but close together. Malignant disease is manifested by one of these beginning to grow rapidly and absorbing the others in succession as its base reaches them.

The skin lesions in mice after inoculation with tubercle bacilli usually begin as an indolent superficial ulcer with a smooth base with bleeds readily. It gradually changes its character by the edges becoming thickened and heaped up, while the surface becomes deeper and irregular, and the lesions begin to extend rapidly. Tar and carcinogenic oils act only on the skin of mice, not on the mucous membranes. But in my inoculated mice ulcers, usually in the pyloric region of the stomach, form a series presenting all types from innocent to malignant. They are usually associated with lymphocytic infiltration of the areolar tissue supporting the pancreas. The base of the ulcer is formed by an adhesion between the stomach and the pancreas, and frequently the liver. Lines of lymphocytes may be traced into the adhesion from an enlarged lymph gland which lies among the clusters of lobules of the pancreas. Lines of similar cells penetrate the muscular, submucous and mucous coats, leading to proliferating areas of gastric epithelium or becoming lost in the general infiltration at the margin of the ulcer. If there is no ulcer, many of these mice exhibit signs of chronic irritation in the gastric epithelium corresponding with the base of the ulcer. Portions become cystic or papillary, the tubular glands become longer than normal, and convoluted, with an increase in the number of the lining cells, and hyperchromatic nuclei. Many isolated acini are found in the infiltration surrounding the bases of the glands. Some of these acini lie beneath the muscularis, and others in the adhesion outside the line of the muscular coat. It will thus be seen that the problem of diagnosis is essentially similar to that in human disease, just as the papillary conditions in the human large intestine resemble those produced by tar in the skin of the mouse.

It appears that the preliminary contribution of the polymorphonuclear cells in the sequence of events is to cause the infiltration by which acini or areas of epithelium become isolated. At this point some event occurs which decides whether a tumour of any kind, innocent or malignant, shall

be formed or the condition become fibroid. The appearance of the lymphocytes marks this crisis in the history of the cells. It is the characteristic massing of the lymphocytes which forms the scaffolding for Warburg's phenomenon.

Among human beings external irritants help little to explain the causation of the vast majority of cancers, nor do the forms of the disease found in certain countries, which are traceable to internal parasites, afford any direct assistance. But both are of great value in increasing the probability that chronic irritation is at the bottom of all cancers. Of internal irritants some form of known pathogenic bacteria is the first avenue open for exploration, and my work with the tubercle bacillus may furnish a definite clue. All attempts to show that microorganisms found in human cancers removed at operation are the causal agents have failed, and my experience is that tubercle bacilli are nearly always absent from the tumours in the inoculated mice, even when the tumour arises close to the point of inoculation. I infer that a colony of bacilli has been the cause of the characteristic massing of the lymphocytes, but that these cells overstep the mark. They not only destroy the bacilli, but by overcrowding, asphyxiate each other and so set in motion the chain of events necessary to produce growth-stimulating substances and the specific change to malignant disease.

These details, gathered from many sources, indicate that the problem of the causation of cancer is being more accurately defined, and they show how multiple and unrelated irritants may produce similar changes in the metabolism of the cell. This advance has directed attention to the importance of growth-stimulating substances, and as these can be derived from the autolysis of cells that have lost their full vitality, their action helps to explain the self-supporting growth of malignant tumours.

Growth Stimulants and Cancer.

The discovery by Rous in 1911 that one of his chicken sarcomata could be transmitted by emulsions of the tumour which had been filtered free of every recognizable particle of the malignant cells, opened up a new field in cancer research. At first it was assumed that the chicken tumour agent belonged to the virus group of ultra-microscopic organisms, and the parasitic theory of cancer, which had been generally discarded, again came into the field. The properties of the virus, as exhibited by its apparent multiplication when injected into chickens, seemed to preclude any other explanation except that it was a living organism. The investigation of the properties of this virus has been carried on by J. B. Murphy and his colleagues at the Rockefeller Institute, New York.⁽⁵⁾ Contrary to expectations, it has been found that the active agent can be almost completely dissociated from the protein of the filtrate, or at all events that tumours can be produced by the injection of purified material which has a very low protein content, if any, as indicated by all the known chemical and biological tests.

It has been shown in more than one laboratory that, in regard to resistance to ultra-violet radiation, certain allied bodies may be placed in three groups, the least resistant including bacteria, the phage and vaccinia virus, intermediate group represented by the chicken virus, and the most resistant by enzymes and antibodies.

Hueper and his colleagues in Philadelphia⁽⁶⁾ have just shown that the growth-stimulating substance in chick embryo is apparently not proteid in composition. The extracts made from the developing eye, head and body as a whole are all approximately equally potent; and it appears that the growth-promoting substance is not specific to a single species of animal. It had been suspected of being a polysaccharide, but this idea was negated by the single gramme of such materials obtained from 471 dozen eight-day chick embryos.

The chemistry of carcinogenetic agents has been linked with that of physiological regenerative processes and probably also with that of normal growth and repair. Oestrin has been shown to be closely related to cholesterol by the substitution of a benzene ring in place of H in one of the rings of C-atoms in sterol. Oestrogenic activity and carcinogenic activity are exhibited by two closely allied groups of these derivatives, and some of them have both actions, just as coal tar produces both cancer and oestrus. Sterols exist in every cell, and it is possible that a sharply localized group of cells may, under abnormal conditions of metabolism involving dehydrogenation of sterol, produce the carcinogenic substance.

These results may lead back to physiological functions by the discovery that the metabolic products of muscular activity may be responsible for the hypertrophy that follows increased use of a muscle and have perhaps a stimulating effect on the growth (and repair?) of other organs. Tadpoles and blowfly larvæ fed on fatigued frog muscle grow more rapidly than controls fed on unfatigued muscle, and the tadpoles metamorphosed earlier. The association of growth stimulant and carcinogenic principles is shown by Gye's experience that a weakened or very small dose of Rous filtrable virus produced an innocent in place of a malignant tumour. The time required for the production of tumours in mice has been reduced to about one-half by the use of purified or concentrated products isolated from coal tar, and by synthetic products of similar chemical composition. But the attempt to reduce this period still further by using two or more agents at the same time defeats its object, as ordinary inflammatory reactions ensue and no tumour is produced. In man the early stage of irritation is often so mild that the patient is hardly aware of its presence, and hence it cannot be regarded as inflammatory in the old sense of the term.

In human pathological conditions the tubercle bacillus is the most common activator of the lymphocytes. Hence the correlation between the two diseases, established from the record of the

deaths, may invest the lymphocytes found in malignant tumours with a new significance. They may prove to be as important as they seem to be in my mice. Instead of being attracted as idle spectators of the behaviour of the neoplastic cells, they may be the chief villains of the drama. It is the intimate mixture of the lymphocytes and proliferating cells which gives rise to the chief difficulties in diagnosis alike in clinical material and in experimental cancers.

PART III: THE SITE INCIDENCE IN RELATION TO EXPERIMENTAL RESULTS.

The site incidence of cancer opens up important questions. It varies in different parts of the world, and the variations may be of value in our search for the causes of the disease; and moreover, by separating the usual from the less usual sites, the survey of the whole problem retains its proper perspective. As examples found mainly in special countries may be cited: cancer of the bladder caused by bilharzial infection in Egypt; burn cancer caused by the peculiar custom of the people in Kashmir and China; that of the bladder caused by aniline in certain chemical industries; and primary growths in the liver associated with gross parasitic infection of the intestines seen in Russia, Sumatra, India and parts of Africa.

The comments on the increase and the relative importance of the incidence are chiefly based on the standardized rates in Table III, "Statistical Review", 1930, text page 57. The Registrar-General's introduction to the occupations in 1921-1923 deals almost exclusively with the age group 25-65, that is, the working life of the average citizen. But as a large and increasing part of cancer is found after the age of 65, and an increasing proportion of the population now die after that age (42% of all male and 50% of all female deaths in 1931), it is necessary to extend this survey to the limits of old age. In addition, it will be seen that old age exercises a controlling influence on one at least of the sites, and it seems in some way to reinforce the action of special irritants in others.

Age, Sex and Site Distribution.

Table VIII of the details for England in 1931 shows the proportional distribution by the principal

sites in each age group after 40, and for purposes of comparison the corresponding total deaths from all causes and from cancer. The sites are those tabulated on pages 146-147 of the "Statistical Review", 1931. The outstanding features are: (i) The much higher proportion for men than women at each age group contributed by the mouth and its appendages and by the respiratory system. (ii) The great preponderance of the digestive system in both sexes, especially in men, in whom it contributes about 60% at all ages after 40. (iii) The skin in both sexes is unique among the sites in regularly increasing in importance up to extreme old age. After 80 it contributes one death in every eleven from cancer in men, and in women one in eighteen. At other ages it is relatively unimportant. (iv) In women the uterus and its appendages and the breast are at their highest proportional incidence between 40 and 50. After 60 the digestive system attains the same position as it holds in men. The breast recedes slightly at 70, to increase again in extreme old age.

It will be noted that the site distribution of the deaths differs greatly from that in the tables which give the site incidence of the lesions treated at many cancer clinics.

Formerly great importance was attached to the distinction between accessible and inaccessible sites, but the accuracy of clinical diagnosis has become much greater with the assistance of X rays and other advances. Russell⁽⁷⁾ shows that the increase in the deaths from cancer in inaccessible sites in women between 1891 and 1927 was 13% in England and 40% in Scotland, while the increase in accessible sites in each country was 6%. He deduces that there must have been a real change in the relative site incidence in these countries, assuming that the average accuracy of diagnosis is approximately equal.

Not only are the incidence and site distribution of cancer racial peculiarities, but with the general increase in the disease both the age and site distribution are continually being changed. The older groups are carrying an ever increasing load, as is shown by the following records, extending over a century. The earliest list was compiled at Paris from material collected between 1831 and 1840;

TABLE VIII.
Cancer—Percentage Distribution by Age and Site.

Site.	Men.						Women.					
	All Ages.	40-50.	50-60.	60-70.	70-80.	80 and over.	All Ages.	40-50.	50-60.	60-70.	70-80.	80 and over.
Mouth of oesophagus	10.7	6.6	11.1	12.1	10.3	10.2	1.6	0.97	1.0	1.9	1.6	1.5
Digestive organs	61.3	57.5	60.3	63.4	63.6	59.2	48.6	31.1	39.5	53.4	61.0	59.4
Respiratory organs	9.1	17.1	13.6	7.6	5.7	3.5	2.8	3.6	3.3	3.1	1.9	1.1
Genito-urinary organs	11.4	8.4	8.2	11.3	14.0	16.7	19.0	31.1	23.0	17.0	12.3	8.2
Breast	—	—	—	—	—	—	20.2	28.7	24.2	17.6	15.9	18.7
Skin	2.4	1.3	1.7	1.5	3.2	8.9	1.5	0.5	0.9	0.88	2.0	5.2
Other sites	4.7	7.5	5.2	3.6	3.0	3.1	6.0	5.4	5.7	5.8	5.7	5.0
Total number of deaths—												
Cancer, all sites	27,777	2,073	5,924	9,884	7,229	1,032	31,569	3,746	7,124	8,551	7,683	2,685
All causes	249,717	19,654	34,318	50,603	53,190	24,717	241,913	16,646	27,730	43,478	57,499	38,989

the others are the total number of deaths from cancer registered in England for each of the periods indicated:

Sex.	1831-1840.	1851-1860.	1891-1900.	1931.
Males	2,163	18,159	88,987	27,777
Females	6,955	42,137	143,191	31,569

TABLE IX.
Percentage Age Distribution.

Period.	Males.			Females.		
	0-34.	35-64.	65 and over.	0-34.	35-64.	65 and over.
1831 ¹	12.6	38.2	49.1	2.82	58.6	38.5
1851	9.7	55.4	34.5	7.4	66.0	26.8
1891	5.3	55.9	38.7	4.5	61.7	33.8
1931	2.3	46.6	50.8	2.3	50.3	47.3

¹ The age groups for this period are: 0-29, 30-59, and 60 and over.

The Skin.

The standardized English rates for cancer of the skin show that the incidences have remained practically constant for the past twenty years for both sexes, the rate for women being about two-thirds that for men. In both sexes the rates increase rapidly after the age of 60. The relation of this increase to the advance of age probably depends on definite changes in the nutrition of the skin. Presumably the change is in some way dependent on alterations in the blood supply, and a lessened degree of irritation is sufficient to produce the malignant change in such altered areas. Chronic external irritation of a definite kind is found in a certain proportion of the cases, and this evidence is reinforced by that from other parts of the world and also by the fact that cancer can be produced experimentally by means of some of these chronic irritants. Such agents produce at first an acute dermatitis with marked hyperæmia followed by a chronic stage in which the surface epithelium is thickened and the hair follicles and sebaceous glands to a great extent disappear. The polymorphic infiltration is replaced chiefly by lymphocytes. The proliferative changes running on to malignancy may begin in the deeper layers of the epithelium or in some of the isolated hair structures. Isolated patches of thickened epithelium with atrophic hair structures are among the senile changes in man.

Among the occupations in England, lubricating oils and soot have been definitely identified, and heat appears to be associated with malignant changes to a much less extent in the case of gas stokers, iron puddlers and brickmakers. Coal tar, which is the chief experimental agent used in the production of the disease, does not seem to increase materially the cancer rate among the thousands of asphalters and road-makers who are regularly working with that material, although, of course, isolated cases occur.

Sweeps' cancer was the first industrial form to be recognized, and was long looked upon as essentially an English disease, very few instances having been seen in America or on the Continent. Hence there has always been a doubt as to whether another factor is not involved, and all efforts to produce cancer in laboratory animals by means of crude soot have failed. Table X shows the relation of phthisis and cancer to the total deaths in this occupation during the past forty years.

TABLE X.
Sweeps' Cancer in England.

Census Period.	Total Deaths.	Cause of Death.	Age Period.				
			25	35	45	55	65
1891	471	Phthisis	19	24	20	12	2
		Cancer	—	7	21	17	16
1901	516	Phthisis	7	29	22	16	2
		Cancer	1	6	13	23	27
1911	511	Phthisis	8	21	14	15	4
		Cancer	1	6	12	18	33
1921	394	Phthisis	2	7	8	10	2
		Cancer	0	4	14	20	41

The percentage of the total deaths from cancer due to the special "sweeps' cancer" was 29.5 in 1891, 32.0 in 1901, and 26.6 in 1921, and the "Decennial Supplement", 1891, page xc, contains the following:

There is no other occupation in which the ravages of cancer at all approach this . . . there has happily been a great abatement since the previous record. In 1880-2 the mortality figure had been 290, whilst in 1890-2 the figure, modified to allow of comparison, was 157, showing a reduction of nearly half.

In the same interval the mortality figure for deaths from all causes had only declined from 1,652 to 1,525 ("Decennial Supplement", 1901, page ccviii). The peculiar incidence of cancer of the upper part of the alimentary tract in sweeps will be dealt with at a later stage.

On Graph E the cotton manufacturers have an average position for both diseases, but one section, spinners and piecers, constituting one-fourth of the occupation, have an abnormal incidence of cancer of the skin, accounting for 23.4% of all the deaths from cancer in that section. This has been traced to the lubricating oil with which the clothing formerly became saturated, and the oil derived from certain beds of kerosene shale has been found to have carcinogenic properties. Of 56 deaths in 1921-1923 in which the skin was the site, 39 occurred before the age of 65, and 17 after that age.

In Australia exposure to intense sunshine is credited with being the chief cause of cancer of the skin, but our mortality rates for both sexes are somewhat lower than those of England. Hence there appears to be some unknown link common to the 195 old people who die of the disease, which is wanting in the thousands of patients who are regularly cured of early cancer of the skin each year. The cold wind and rain of other climates seem to bring about very similar changes in old

age. Ewing, in discussing the sarcoids and granulomata of the skin, refers to the tubercle bacillus in some and diffuse lymphocytic infiltrations in others. He holds that this group is linked to the true sarcomata through the multiple hæmorrhagic sarcoma of Kaposi. The occasional change of a lupus ulcer into cancer is probably due to some modification of the usual lymphocytic infiltration.

The clinical fact that cancer of the skin appears in a small proportion of those exposed to the risk, and after a long period of exposure, perhaps after contact with the irritant has ceased for years, falls in line with what has been said regarding the importance of old age in modifying the structure of the skin. The lengthened period of exposure appears to be the actual number of years it takes a person to grow old—a number which varies with the individual. This phenomenon is quite different from that found in occupations with a high incidence of phthisis, such as clerks and hotel men, for in these the abnormal incidence of cancer affects the younger rather than the older age groups. The problem is to account for the occasional invasion of the skin, chiefly along the shafts of the hairs, by a lymphocytic irritant, a condition favoured by the atrophic change as age advances. The phenomenon is paralleled by the frequent appearance of pustules from polymorphic irritants in the sound skin. The change to a condition of malignancy may be assisted by changes in the secretions of the sebaceous glands, and any hyperæmia increases the probability that a suitable microorganism may be arrested from the blood stream. Once a lymphocytic area is formed, the subsequent steps are probably the same as those in experimental tar cancer. Cancer of the skin thus sheds light on the causation of the disease in other sites.

The Uterus and Adnexa.

These sites contribute 6,000 of the 31,000 deaths of women from cancer, this number being nearly equal to that of the breast. It attains its greatest proportional mortality in the age group of 45-55, after which it steadily diminishes. At the present time three-fourths of the cases affect the cervix, vagina and vulva, and one-fourth the body of the uterus, the ovaries and tubes, but these relative numbers are changing rapidly. The two sections differ in nearly every respect. The first or cervical group is the only site in which the incidence of cancer is diminishing in England, the standardized rates having fallen 10% in the decade 1921-1930 as compared with 1911-1920. It is estimated that 90% of the women in this group have borne children, and the great frequency of signs of injury to the cervix makes it practically certain that a laceration or erosion is the usual predisposing cause. Moreover, as the perineum has also frequently been damaged, the influence of a chronic septic vaginitis must also be considered. It is stated that the uterus is less frequently affected in some Continental countries than in England, but much more frequently in certain non-European races.

Chronic septic conditions about the cervix lead to fibroid changes in the walls of the ulcer with occlusion of the mucous glands. The steps leading to a chronic ulcer are obvious, but why should an ulcer of the cervix tend to become malignant more frequently than a chronic ulcer of the leg? The same problem arises in the lip and tongue and, as in the skin, the solution seems to require the implantation of an irritant with a lymphocytic reaction rather than an organism allied to the pyogenic group which excites the polymorphonuclear cells. The sequence of the changes may follow that outlined in those from acute to chronic dermatitis in experimental tar cancer. The inflammation of the cervix would remain chronic, tending to become fibroid in structure, but the conditions necessary for the change to malignancy exist in the irregular proliferation of the surface epithelium and the occluded mucous glands. As in the tarred mouse, this change follows the appearance of the lymphocytes, which are usually found in great numbers in this lesion. In many sites where the process begins as a septic inflammation the same sequence occurs. Extending my experimental results to this problem in man, there is definite evidence to show that of the two classes of cellular reactions, that associated with septic organisms does not lead to cancer until the infiltration has become lymphocytic. On the other hand, cancer may begin on the basis of a reaction lymphocytic from the first. As in the skin, the essential problem is to determine the cause of the one class of cells replacing the other.

On the analogy of the cervix the two less common sites, the body of the uterus and the Fallopian tubes, may become malignant under somewhat similar types of irritation. The corpus presents the lining epithelium, deep epithelial glands and the muscular walls. The stages corresponding to experimental cancer of the skin may be seen under the microscope, such as the heaping up of the surface epithelium and the isolation of the glands beneath inflammatory thickenings or by proliferation of the unstriated muscle fibres. As in the case of the cervix, it is necessary in most instances to postulate the presence of a special irritant which can bring about the malignant change. Tubal cancer is rare, and bilateral in about one-third of the cases, but the preliminary stages often show chronic inflammation with thickening of the walls and multiple papillomatous overgrowth of the mucous membrane. In one of Ewing's cases "the mucosa of uterus and both tubes was the seat of diffuse adeno-carcinoma and co-extensive tuberculosis".⁽⁸⁾

Deaths from cancer of the ovary have nearly doubled in the certificates during the past twenty years, constituting at the present time about one death in every twenty-five from cancer in women. The irritant would appear to be less important in this than in most other sites, because the immense number of potential ova would, on Cohnheim's hypothesis, offer unlimited scope for erratic overgrowth. If in addition to cells prepared to pro-

liferate, there is also required an irritant to begin the process, this must reach the ovary either by the blood stream or by the peritoneal cavity. Now tumours of the ovary are not infrequently bilateral, and this fact has been used as an argument against the presence of an irritant. But tuberculosis of the epididymis is a parallel case, for the only probable means of access is the blood stream or by extension from a local focus. The older pathologists accepted the former route and regarded the bilateral symmetry of the lesions as an instance of the mutual selective preference existing between the bacillus and a special type of tissue.

The Breast.

Among English-speaking women the breast is the second site in order of importance, coming next to the stomach, mammary cancer constituting about one-fifth of the total mortality from cancer. In England the standardized rate increased by 19% between 1901-1910 and 1921-1930. This organ is not affected to the same extent in several other European races, of which Holland, Sweden, Norway and Italy are examples, while it is very rarely affected in the Japanese. Recent investigations have been carried out in England by Lane-Claypon⁽⁹⁾ and in Pennsylvania by Wainwright,⁽¹⁰⁾ including in each instance over a thousand women. In 1911 it was stated by the Registrar-General that cancer of the breast was more common in single than in married women in the proportion of three to two. Wainwright's results show that, if the comparison is made between those who have never nursed a child and those who have, the proportion rises to two to one, and further, that the greater the number of children nursed the less is the incidence of cancer.

Hitherto it has been impossible to make any precise statements about this form of the disease, because the bruise that is often mentioned appeared too weak a peg on which to hang a theory. But the old indefinite idea of a constitutional predisposition is changing into definite knowledge of the cause and course of local irritation. The significance of a number of factors is gradually becoming apparent. More than fifty years ago the suggestion had been made that both chronic mastitis and cancer were related to the presence of retained secretions, and there are now indications that a connexion between the two conditions is again coming into favour. Cheate has emphasized the insidious character of the precancerous inflammatory stage, pointing out that the normal appearance of the epithelial cells changes before they break through the boundaries of the acini or terminal ducts. He thinks from this that the irritant must act directly on the cells, and insists that the change to malignancy involves other factors beside increased blood supply. The interstitial tissue in the chronic inflammatory conditions may be thickly infiltrated with lymphocytes, and the importance of these cells in the early stages of malignancy has been stressed by Sampson Handley. The combined effect of retained secretion and lymphatic obstruction is to cause the formation of

small or large cysts, and as these cysts often contain cholesterol from the milk, a factor is introduced which brings us very close to the derivation of growth-stimulating substances as revealed by experimental cancer of the skin. Lane-Claypon and Wainwright agree that suppurative mastitis has no share in predisposing to cancer, but that non-suppurative mastitis is the frequent prelude. As the latter condition brings about heaping up of the epithelium with isolation and occlusion of the terminal ducts and acini, the phenomena are essentially similar to those found in the skin of tarred animals or the human *cervix uteri*. The problem is not to draw the precise line (if any exist) at which proliferation changes into malignancy, but to find the irritant which is capable of setting up the chronic inflammation and which is at the same time a probable associate with all civilized races of mankind.

On the other hand, the school that teaches the complete independence of cancer and mastitis is very much in evidence, some of its members refusing to admit that inflammation has anything to do with cancer of the breast. They point to the periodic function of the organ and to the fall in the birth rate, which may well explain both the reduction in the cancer of the uterus and the advance in that of the breast, for the cells of the mammary gland are waiting to respond to the normal call to physiological activity. Hyperæmia may thus lead to a futile effort towards secretion in a single lobule, and a very small amount of retained secretion may form the original focus. The hyperæmia increases the chance of the advent of a lymphocytic irritant by the blood stream, and the machinery leading to malignancy is thus set in motion. Twort, from his great experience of the production of inflammatory and carcinogenic agents from coal tar and lubricating oils, thinks that there is little difficulty from the chemical point of view in visualizing the production of the necessary stimulant from the retained secretion. He mentions specially a group of compounds containing the carbon skeleton of phenanthrene, which may act in conjunction with oleic or other unsaturated fatty acid.⁽¹¹⁾

An interesting point in the family history of cancer of the breast has been brought out by Lane-Claypon and Wainwright. In both countries there is a small but consistently higher incidence of cancer in the mothers and sisters of the patients with cancer than in those of the controls, and in America a similar excess was found in the brothers also. This evidence may point to inheritance, but it is of the same nature as that relating to tuberculosis. As we now know, the inheritance of tuberculosis is extremely rare, but facilities for infection by the bacillus run in families, so that the resulting incidence has every appearance of inheritance.

The Digestive System.

The organs of the digestive system are by far the most common site of cancer in both sexes, cancer

affecting them contributing 72% of the deaths in men and 50% in women. The great excess in men is partly due to the way in which the upper part of the alimentary tract escapes the disease in women. If the prostate is regarded as an anatomical adjunct to the rectum, it may with truth be urged that cancer in man is essentially a disease of the digestive system, as some part of it is affected in four-fifths of the cases. The standardized rates show a steady advance in all parts with the exception of the lip in man, while in women there has been an advance of 80% in the intestine, 65% in the pancreas, and 17% in the stomach. There is also a small increase in that of the œsophagus. Chronic irritation as a predisposing cause is seen in several of the sites peculiar at present to men. Smoking has always been suspected of having a share in cancer of the lip, but the evidence has never been very convincing. Some of my friends at the cancer clinics tell me that they have recently been impressed by several instances of young men who attribute an early epithelioma to a blister raised by accidentally applying the burning end of a cigarette to the lips; and the high incidence of this site in farmers, farm workmen, platelayers and other labourers may indicate that senile changes occur in the lip similar to those found in the skin as the result of exposure to wet and cold. The selection of the lower in preference to the upper lip precludes the idea that there is anything special in the male lip and directs attention to the probability of a specialized irritant. So also in the tongue, after excluding irritation from the teeth and syphilitic lesions, there remain a number of inflammatory conditions which cannot be assigned to a definite irritant, and these remarks apply also to the pharynx and tonsils. Cancer of the jaw is more than three times as common in men than women, but in all the other bones the excess in men is about 30%. If we postulate pyorrhœa as the indirect cause of cancer of the jaw in men, it seems difficult to account for the women escaping so lightly. These sites included under "buccal cavity" are affected nearly seven times as frequently in men as in women, and in the next site, the œsophagus, the male excess is still three to one. An attempted solution of this anomaly is to regard the active agents as being so related to the number of women that all those available for cancer are accounted for by the sites that are most readily invaded by the agent—the stomach and intestines, the breast and uterus. And it will now be shown that the lip, tongue, œsophagus and stomach suggest some such explanation in the case of men also.

The Registrar-General remarks that cancer mortality shows very definitely the same type of social distribution as that from phthisis, increasing from a minimum of 79.8% of the average in Class I to a maximum of 122.9% in Class V, and that the difference between the highest and lowest social classes was still more marked for certain exposed sites and for the upper alimentary canal ("Decennial Supplement", 1921, page XXI). On taking out

the proportion which cancer of the lip, tongue, œsophagus and stomach bears to the total deaths from cancer in the twenty-four principal occupations, I found that this percentage varied from 22.8 to 40.2. The lowest was sweeps, followed in succession by the clergy, clerks, bankers, cotton spinners, salesmen, grocers, drapers and commercial travellers. The highest group, ranging from 38% to 40.2%, comprised farm workmen, carters and drivers of horse vehicles, plumbers, brass workers, coal miners, unskilled labourers, dock labourers and costermongers. The lowest group on Graph E includes the clergy, farm workmen and coal miners; the highest includes clerks, sweeps and dock labourers; but the incidence of cancer in the upper part of the alimentary tract is controlled by a different mechanism from that which decides the incidence of the disease in general. Can it be that in sweeps the susceptible men are monopolized by the skin and in clerks by the intestines, so that certain other sites are not invaded?

The Abdominal Digestive System.

The abdominal digestive organs are the great centre of malignant growth in both sexes, the deaths from these organs constituting 56% of all deaths from cancer in males and 45% in females. In the vast majority the primary growth affects the stomach, colon or rectum. As the primary site is now more carefully noted, an apparent reduction has taken place in cancer of the liver, mesentery and peritoneum. A steady increase is taking place in these principal sites as well as in the pancreas and gall-bladder. The fact that there is so little evidence of local irritation in the stomach and intestines, the parts which are most frequently affected by cancer, modifies the impression of the importance of local inflammation which is derived from the skin and *cervix uteri*. Those two sites fall very nicely into line with the experimental work with tar so that one might be led to infer that tar cancer may be taken as the ordinary type of the change to malignancy. It is natural, therefore, to search for irritants in the food and to assume that in cancer of any part of the intestinal tract the irritant enters the mucous membrane by penetrating through the epithelial cells, and to claim the weight of the incidence relating to gross irritants of the lip and mouth as applicable to other parts of the digestive tract also. But our knowledge of the chronic irritation in the stomach, colon and rectum is largely of a negative character. Opinions vary as to simple ulcers of the stomach and duodenum, but most clinicians think that they seldom become cancerous; and the same applies to dysenteric ulcers of the large intestine. The gall-bladder furnishes perhaps the most definite data regarding the evolution of malignancy. It occupies a site near the pylorus and sigmoid flexure and is in direct communication with the contents of the duodenum through the duct. The standardized rates show an increase of about 45% in each sex in the ten years between 1911-1920 and 1921-1930. The number of

deaths is still relatively unimportant, as this site contributes less than 1% to the total deaths from cancer in men and 1.77% in women. As in the cervix, the presence of microorganisms is usually demonstrable as an irritant, and as these are of low grade virulence, the lymphocyte replaces the polymorphonuclear cell of acute cholecystitis, or the condition may never have been acute. The typhoid and colon group furnish a large proportion of the organisms, and the presence of gall-stones may be taken as further evidence of bacterial activity. Chronic cholecystitis may produce new formations of glands of various types resulting in an abnormal picture of epithelial proliferation. Such glands may even be found among the muscle layers or beneath the peritoneal coat, so that diagnosis is a complicated matter.

The Prostate.

The prostate now accounts for about 5% of the deaths from cancer in men, the incidence having increased threefold between 1901-1910 and 1921-1930. While improved diagnosis may be responsible in part, the greater part of the increase is probably due to the larger proportion of the male population which now survives the age of 60, for the prostate associates itself with old age to a greater extent than most sites of cancer. Although malignancy and hypertrophy of this organ appear to be distinct from each other, the occurrence of adenoma and myoma as less common lesions raises the question whether one irritant may not bring about the whole of these conditions, the type of change depending on the abundance of growth stimulus and the intensity of Warburg's phenomenon. The great masses of lymphocytes frequently found in the diseased prostate, and the presence of retained secretion, as well as the regular involution of the organ, are points in which its problems resemble those of the breast.

The Respiratory System.

Cancer of the lungs and larynx causes about one-tenth of the total cancer mortality in men and one-third of that proportion in women. Both sites are increasing rapidly in importance in men, and the lungs also in women. Most of the special irritants that have been suggested, such as petrol fumes and tar pavements, are rather fantastic, but the main fact remains that the lungs affected with cancer are very often affected also with anthracosis or phthisis. Particles of coal are mild irritants and, as we have seen, coal miners have a very low incidence of both phthisis and cancer. When the lungs of a phthisical patient break down into cavities, these become septic and cancer does not occur, so that florid phthisis has a definite antagonism to cancer. But in parts that are healed or healing the lymphocytes reappear, and Ewing (page 852) writes definitely:

The chief etiological factor is tuberculosis . . . In the old scleroses, atelectases and reparative processes of tuberculosis may be seen many alterations of bronchial and pulmonary epithelium marked by considerable cellular overgrowth.

Summary of the Evidence.

This survey of the principal sites of cancer shows that in accessible parts so-called inflammatory lesions are often present sometimes for a long period before the onset of malignancy. In some sites it is believed that phases are passed through very similar to those found in experimental tar cancer. It is therefore probable that the early lesion serves for the localization of the carcinogenic agent. This agent is associated with a lymphocytic infiltration as distinguished from the polymorphic reaction with which the initial lesion usually arose. In several of the common sites of cancer attention has long been drawn to the lymphocytes, and in some instances the conditions are strictly comparable with my results in the pyloric region of mice which have already been described. The significance of the part played by syphilis in the tongue and by tuberculosis in cancer of the skin may thus be explained. This stage makes it easy to understand the importance of overcrowding and the phenomenon of Warburg leading to the production of growth-stimulating substances, and also the evolution of the malignant cell. The points already noted in connexion with cell metabolism and abnormal changes in the sterol group may be the link connecting lymphocytic irritation with malignancy.

Cancer appears always to arise close to the irritant, but this does not require the irritant, whatever its nature, to reach the spot by the most direct route from the outside world. If we accept bacteria as internal irritants, it is probable that they reach their locus by the blood stream in the majority of cases, and in that case the selection of the pylorus and adjoining viscera in the abdomen offers no difficulty. In my mice the tubercle bacilli select this locality probably because of its proximity to the spleen, the organ to or from which they are often being conveyed. Both lymph and blood streams are their highways. If they become stranded the lymphocytes at once hurry to the point, and in the attempt to surround them the varied pictures of the lymphoid syndrome and Warburg's phenomenon may result.

Many details of the requirements of the problem as gathered from this survey would be met by an organism of the type of the *Bacillus tuberculosis*. As a working hypothesis we may assume that there is a selective affinity between the active agent and the epithelium of the digestive organs and of the breast, just as certain bones are known to be the site of cancer more frequently than the other parts of the skeleton. The deeper structures in the wall of the intestine may pick up cells which have ingested bacilli, or the organisms may be carried into the circulation and deposited from arterial blood in the wall, just as they probably are in the breast. At present the weight of evidence seems to be in favour of blood stream infection of the coats of the gall-bladder—a site in which direct spreads from the interior of the intestine would appear to be the obvious route. The fact already mentioned, that the most frequent sites of cancer are those in

which least is known about the chronic irritants, makes it possible that the usual route to these sites is an indirect one.

As to the description of the effective irritant, whatever may prove to be its nature, the use of the term inflammatory needs revision. Since Warburg has shown that the irritation leading to the precancerous stage is essentially of the nature of oxygen deficiency, I think the term inflammation should also be more definite. Historically it was coined to describe septic changes and its symptoms were defined accordingly. But the old term "cold abscess" and the painless enlargement of tuberculous lymph glands indicate that the distinction was recognized long ago. Polymorphic inflammation tends to suppuration followed by repair. The overcrowding of the polymorphonuclear cells leads to their death perhaps as effectively as do the toxins of the bacteria they have engulfed. The overcrowding leads to organization and fibrosis, presumably because their autolytic products have not the same properties as those of the lymphocytes. "Small cell infiltration" would be a better description of the precancerous stage, and carries with it no implication of any theory of function.

PART IV: THE BACILLUS TUBERCULOSIS AS THE INDIRECT AGENT.

From the foregoing survey cancer is made to appear as the shadow of tuberculosis—a totally different disease arising from the same cause and becoming common only after the inhabitants of a given country have developed resistance to tuberculosis. At first sight this appears an extravagant thesis, and its enunciation requires to be justified. And the additional evidence must appeal to two types of mind. To some it may appear that the analysis of the deaths by means of the census units showing complete interlocking of the two diseases, and by means of the occupations showing the close resemblance in the methods of origin, constitute little less than a rigorous proof of some relationship between the two. To others, with an ingrained caution as to the value of figures in relation to human affairs, it may appear that more experimental evidence is required to corroborate the statistical results. The following points offer food for both types:

Cancer a Unique Disease.

1. Cancer is a unique disease. It is not a form of tuberculosis, for while tuberculosis easily falls into its place among the bacterial diseases, cancer occupies a position of its own. The progress of a tuberculoma or the destruction of the lung continue only so long as the bacilli continue to multiply and extend their zone of operations. The essential characteristic of a cancer is that it possesses some means of keeping up the supply of a growth stimulus so that its growth ceases only when the resources of the host to supply nutriment have been exhausted. It differs from chronic infective diseases in that the tendency is never towards recovery. So

far as is known, the body does not elaborate antibodies to meet the attack. It is practically a new disease because, although it has been well known for thousands of years, it has never been so common as it is at the present moment. The slogan of the annual reports has become: "The number of deaths from cancer is the highest on record."

2. Cancer is unique also in being an exaggeration or even a caricature of normal growth processes rather than the ordinary reaction of the body against invaders, whether these are alive or dead. Its cells, even when most malignant, are treated by the surrounding tissues as friends rather than as foes. Its relation to normal growth is seen in the manner by which malignant tumours emerge from those that are innocent, so that in some cases the line of demarcation is defined in different ways by experts of equal experience. Small or weakened doses of an irritant which causes malignant tumours may provoke only an innocent growth, and except that the innocent tumour has no function, its structure may indicate that it is a normal part of the body. No theory of cancer is complete unless it can account for innocent as well as malignant growths.

3. Cancer is also unique in the circumstances under which it occurs. It is most common as one among the causes of death in the years which form the threshold to old age; but it may be congenital, or occur in childhood or in extreme old age—in the decade when the average population is much less than the number of deaths. Yet in old age it is peculiar in that it causes a recrudescence of life processes in certain cells instead of the slowing down of tissues that are nearly worn out.

4. Cancer is unique in being caused by a variety of unrelated irritants, some acting from the outside of the body, others as chemical substances or pathogenic bacteria establishing themselves in the midst of the living tissues. The apparent causes are multiple, the resulting product—malignancy—is a unity. It is unique in that nothing else is known in the range of the biological sciences with which it can be compared. Hence it is almost certain that the apparent causes act indirectly and the unifying characteristic is that they set in motion some mechanism which becomes the direct cause of the change to malignancy.

The Bacillus as the Active Agent.

The evidence which identifies the tubercle bacillus as the most common of these indirect causes of cancer comprises:

1. The facts obtained from the analysis of the deaths in England and Wales as set out in this paper. This evidence cannot be ignored unless the view is taken that the margin of error of diagnosis in the certificates of death is so great that they are of no value for such a purpose. It has been already pointed out that absolute accuracy is not necessary, but only the means for obtaining a fairly uniform grade of average accuracy from decade to decade, and that there are data by which this can be done.

Hence this evidence must be allowed to carry reasonable weight.

2. The summary of my experimental results indicates that the bacilli establish themselves in the mice and act as a chronic irritant. They produce widespread lymphocytic infiltrations and a form of lymphatic leucæmia is the most common condition found in the mice when death has occurred several months after inoculation. In addition, there is a series of tumours, epithelial and mesoblastic, a proportion of which are malignant. Lastly, there are ulcers of the stomach or duodenum, often involving the pylorus, with adhesions to the adjoining viscera and with evidence of malignancy in some of the ulcers also. The association of this syndrome with lymphoid leucæmia, apparently connecting the initial leucæmia with sarcoma, is the more significant since Martland has traced the same series of changes in many of the New Jersey luminous watch dial painters, and additional significance is given to my work when the same type of malignancy was obtained by two unrelated agents, thorium and the tubercle bacillus.

3. The intermediate step, the mobilization of the lymphocytes, is the same for the tubercle bacillus and several other external and internal carcinogenic agents. Some types of anæmia are now widely accepted as allied on the one hand to malignancy and on the other to tuberculosis.

4. Pathologists, of whom James Ewing may be regarded as the leader, are prepared to find from the study of human material that the tubercle bacillus is one at least of the bacterial irritants that cause cancer.

5. The bacillus is the most common agent that mobilizes the lymphocytes in human beings.

How it Meets the Problem.

If the tubercle bacillus be accepted as the usual cause of cancer, especially when it affects the internal organs, the following puzzles are placed in a fair way towards solution.

1. The uncontrolled advance of cancer is simply due to the decline in the deaths from tuberculosis being associated with the continuance of unrestricted opportunities for reinfection. The number of people who have survived their first contact with the bacillus is continually increasing. Scotland, with the highest known cancer rate, is a good example of the immediate result of an intensive tuberculosis campaign.

2. The apparent modernization of the disease is the reflex of the stage attained by a given community in the history of its development of resistance to the bacillus.

3. The age distribution of cancer is at once explained. There are few cases in early life, but these increase steadily in each age group after twenty. A certain small percentage appear to escape effective contact with the bacilli until extreme old age.

4. The action of the bacilli as a chronic irritant and their disappearance after having brought about the crisis in the life history of a group of cells accounts for the absence of tissue reaction against an aseptic, actively growing tumour.

5. Being dependent upon growth-stimulating substances, the whole gamut from innocent to malignant may be caused by the one agent.

6. An explanation of the anomaly of two distinct diseases being dependent on the one bacillus is that the one is its direct, the other its indirect result.

The Mode of Infection.

As to the method of infection, the probability is that cancer is not caused by the lighting up of an old focus of tubercular infection, but by a fresh invasion by the bacillus. In support of this thesis it is to be noted:

1. If the individual reinfected himself from old tuberculous glands, the correlation with cancer should be closer with "Tb., all forms," than with phthisis. Such glands frequently contain quiescent bacilli, and as they were characteristic of scrofula their influence should be appreciable in the census units for 1841 and 1851, but this is not the case. On the contrary, it is known that the enlarged glands of early life begin to become firmer and smaller at about the age of twenty, through the formation of a fibrous capsule. This capsule becomes organized and the gland ultimately may disappear. Hence the chance of the escape of bacilli from the interior of the old gland when the person arrives at the cancer age is very small.

2. In dealing with the occupations it was found that the highest incidence of both phthisis and cancer invariably go together, that is, both diseases may be dependent upon ease of invasion by the bacillus.

3. In dealing with the sites it was noted that by analogy the overwhelming preponderance of cases affecting the alimentary canal, especially in men, is *prima facie* evidence that food is an important means of infection. It is therefore worthy of note that farmers, the clergy, bank and insurance officials, chimney sweeps and brass workers have an unusual type of incidence in old age, there being a great rise after the age of 75 as calculated by the numbers at risk. Now sweeps have a very high rate for tuberculosis and the highest rate for cancer of the skin, old age being reinforced by contact with soot, the special irritant. Brass workers were reported in 1901 as exhibiting "the greatest excess of mortality under the head of phthisis, the figure for which is above the average of the occupations by 45 per cent." As these two members of this list furnish indications of special factors, the question may be asked if the three other numbers (all with low phthisis) may not have more than the average opportunities in old age of infection through the milk which they probably consume?

The Control of Cancer.

As in tuberculosis, there are two chief modes of infection, contact with bacilli from the sputum of phthisical persons, and the milk of tuberculous cows. The former is probably the more common method, for otherwise the correlation between cancer and phthisis would not be so intimate as it is. Now, when both the patient and his companions are aware of the risk, the chance of infection is not very great, as is seen in consumptive sanatoria. It is apparently greater in the case of the old person who has a winter cough and who has never been examined for tubercle bacilli. The importance of the want of pure air is seen in the range of countries with cold winters, which also have very high rates for tuberculosis. Among these, Norway, Sweden, Switzerland and Scotland also exhibit very high cancer rates. In the occupations the same general principle is illustrated by the clergy and farm workmen on the one side, and clerks and musicians on the other. But regarding the special risk run by the average healthy individual, there are no data for estimating whether an afternoon spent in the open air shouting at a football match is more dangerous than an hour among the coughs of a darkened picture theatre. The essential thing is to educate the unfortunate patients with phthisis so that, while they are living a seemingly normal life, they are taking unobtrusive steps to reduce the chances of infection from themselves to a minimum.

Bovine bacilli from cow's milk are a possible mode of infection, the importance of which is a matter of speculation. If cancer were common in children, the importance of milk would at once be recognized, but as adults for the most part drink the same milk as children and no evils result, it is assumed that resistance is rapidly acquired with age and that milk is harmless. If the tubercle bacillus is recognized even as only one of many causes of cancer, the whole question must be reopened. The eradication of tuberculosis from cattle will be a very difficult matter, even if the full cooperation of the owners can be secured. In Australia, where fat cattle are never housed, but nearly all their lifetime is spent under a cloudless sky, tuberculosis affects the animals slaughtered to the extent of at least 5%. Milk presents a more complicated problem than meat, because the milk of many cows is mixed before it is distributed and practically every drop of milk is consumed. In England the bacilli can be identified once in every twelve samples, in Glasgow once in every seven samples, and in that city 37% of tuberculosis in children is of bovine origin. Boiling the milk is an obvious safeguard, but the extent to which it will prevent cancer can be known only after it has been tried. Boiling has the advantage of throwing a measure of responsibility on the individual, and individual responsibility is essential in attacking the problem of the tubercle bacillus. Queensland has an exceedingly low death rate for infants under the age of two years, in spite of its subtropical climate, due

in all probability to the widespread custom of boiling the milk as soon as it arrives at the house. A new custom can be established if it works well.

SUMMARY OF CONCLUSIONS.

1. The records of the deaths of the young adults at the four census periods 1841-1851-1861-1871 are now complete to old age, and that of 1881 to the age of 65. By adding together the deaths from phthisis and cancer and dividing the sum by the number of deaths from all causes in the same census unit, there is obtained an almost uniform percentage in each series of the four. At the age of 65 the five census units give nearly equal percentages. Hence I conclude that the two diseases are closely related. Analysis of the records of the occupations confirms this correlation and makes it probable that the incidence of cancer depends on the facility with which adults come into contact with the tubercle bacillus.

2. Results obtained by the inoculation of mice with minute doses of virulent tubercle bacilli show that there is a definite production of leucæmic conditions, of neoplasms and of ulcers near the pylorus. These lesions are usually associated with an intense lymphocytic infiltration, parts of which appear to offer suitable conditions for the exhibition of Warburg's phenomenon of oxygen starvation and the development of malignancy. The microscopic appearances are compatible with the sequence of events seen also in experimental tar cancer.

3. An examination of the early stages of cancer in various sites tends to show that they also often follow the sequence of events seen in tar cancer. The precancerous changes are usually due to an irritant producing a mixed cell infiltration, but the polymorphonuclear cells are replaced by lymphocytes as the proliferation approaches the stage of malignancy. This is comparable with the reaction found in the inoculated mice. But, on the other hand, very little is known of the precancerous stage in the most common of all sites—the abdominal viscera. Here my experimental results with mice seem to have a direct bearing on the problem of human cancer. These results point to the conveyance of the irritant by the blood stream to the neighbourhood of the pylorus. Presumably in one series of sites the irritant may be implanted locally, but in the majority of instances it is borne by the blood or lymph stream, and it seems to have a selective affinity for special sites analogous to that exhibited by the tubercle bacillus for the lungs, or the typhoid organism for the small intestine.

4. In view of the evidence thus assembled, cancer appears as a unique disease, in most cases caused indirectly by the tubercle bacillus and directly by the consequent lymphocytic reaction. A survey of the cancer problem from this point of view suggests that the control of the disease is practicable. It is essential not only to reduce the incidence of phthisis, but also to reduce the facilities for healthy adults coming in contact with the bacillus.

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THE IMPORTANCE OF EARLY TREATMENT OF VASCULAR NÆVI.

By E. H. MOLESWORTH, M.D., Ch.M. (Sydney).

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ON numerous occasions it has happened that children showing hæmangioma of the skin have been referred for treatment of the lesion only at a comparatively late age. The parents in such cases have almost always been advised by their medical attendant to leave the nævus until the child has attained a certain age.

I have not been able to locate the source from which this doctrine is derived, but the story has been repeated in so many cases and so many different practitioners are alleged to have given the advice that one feels certain that it must be the result of teaching provided in some text book. My object in writing this contribution is to point out that this teaching is indubitably wrong.

It is quite true that in a very small proportion (not more than 1%) of cases of hæmangioma making its first appearance within a week or two of birth, spontaneous resolution occurs, but in almost all the rest, not only does resolution not occur, but the angioma increases in size, often to an alarming extent. It is obviously bad policy to allow ninety-nine of these growths to grow as they do for the sake of avoiding treatment in the hundredth case.

Several other considerations have to be taken into account besides the mere increase of size of the angioma.

1. The epithelium covering these growths gradually becomes thinned by stretching in the course of the months during which the angioma persists, so that even if complete resolution of the tumour

is obtained, the skin at the site remains often thin, papery and atrophic in appearance.

2. It is true that hæmangiomata are highly sensitive to radiation while they are actively growing, but when growth ceases this sensitiveness is greatly diminished, so that after a few years the blood vessels of which they are made up, are little, if at all, more sensitive than normal tissue.

During the first six months and preferably during the first month of life, the nævus can be suppressed in most cases by a single normal tolerated dose of radiation. This insures that no obvious damage is done to the overlying and surrounding tissues and after a year or two it is impossible even to see where the nævus has been. Between six months and a year of age the treatment has generally to be repeated on several occasions. Partly owing to this multiplication of exposures and partly owing to the long-continued stretching of the overlying epithelium, it is only occasionally that the perfect result mentioned above can be achieved. At later ages still complete resolution of the hæmangioma is either impossible or attained only at the expense of permanent cicatricial marking. Moreover, it is obvious that if a mark is to be left at all, it is better that the mark should cover as small an area as possible.

Considering all these aspects, no other conclusion is justifiable than that which recommends the earliest possible treatment of these disfiguring growths.

In early cases the method for choice is also undoubtedly that by means of radiation. Other methods, such as diathermy, the use of carbon dioxide snow, are much more liable to produce obvious and permanent scarring, and should be reserved for treatment of those patients who report for treatment only when the growth has become radio-resistant.

It does not matter whether radium or X rays are used; both are equally satisfactory, provided even distribution of radiation effect is achieved.

Owing to the great disadvantage imposed upon a radium plaque by the operation of the law of inverse squares, a nævus having a depth of 0.5 centimetre or more can be dealt with more satisfactorily by the use of an X ray tube at thirty centimetres distance. This can easily be made to provide 75% of the original radiation effect at one centimetre depth.

Personally, I prefer to use an X ray tube on all these cases, since the effects are never worse and often better (especially in deep nævi) than those obtained by radium plaque. My reason for this preference is that the dose required is never more in early cases than a normal tolerated skin dose, which leaves no visible after-effects on the irradiated area. The delivery of the dose is also much quicker and can be done at a low cost.

But provided due account is taken of the depth to which the growth has penetrated, anyone who has learned the simple principles of the use of a radium plaque can provide good results.

Reports of Cases.

CASES OF APPARENT FOOD POISONING.

By R. J. DE N. SOUTER, M.B., B.S. (Adelaide),
Yankalilla, South Australia.

Clinical Histories.

On January 17, 1933, at 6 p.m., I was called to see a number of people who were said to be suffering from the effects of bathing too soon after a meal.

I found a household consisting of two families—two women (A. and B.) and their two and three daughters respectively. For the sake of abbreviation I shall refer to these latter as M. and N., and X., Y. and Z. respectively, with their ages in brackets.

Mrs. B. (a trained nurse) was in charge and was not ill. She stated that all of them had dined at 1 p.m. that day, which was hot and humid (90° F. in the shade). At 3 p.m. they had bathed for about twenty minutes. A few minutes later they were taken ill with vomiting and diarrhoea, and some complained of slight abdominal pain. Most of them appeared to be very ill. They remained in the shade on the beach until 5 p.m. They were then taken a short way to their lodgings by motor car.

At 6 o'clock I found all but Mrs. B. and her daughter Z. in the following condition: They were collapsed, sweating, with ashen complexions and subnormal temperatures, pulses about 120 and thready, respirations shallow and slightly accelerated. Vomiting and diarrhoea were profuse, abdominal pain varied in amount; their tongues were flabby and pale, but uncoated. Chest examination revealed no abnormality. Their abdomens were soft and slightly retracted, but not tender. All reflexes were normal. The vomitus was watery and consisted of mucus coloured a brownish red by a flocculent material, but there was no undigested food present. The motions were watery, of a yellowish colour, containing mucus and undigested food of an unrecognizable nature.

The patient Z. (12) was in bed, but apparently comfortable and in a normal state. She had felt sick at the beach after the others had been taken ill and had vomited (in sympathy?), but had no diarrhoea. Judging from this and her rapidly improved condition, it seems doubtful whether she had been affected as the others had. I now considered that these were suffering from food poisoning and treated them accordingly.

Mrs. B. gave the following account of their meals.—On January 17: dinner, roast rabbit (killed that day) and boiled potatoes, stewed apricots and weaties; breakfast, bread and milk, eggs and jams. No food was eaten between meals. On January 16 fresh fowl was the only meat eaten.

At this point, in the absence of any definite history of tainted food, I considered the possibility of heat exhaustion; but the grouping of the cases and the fact that there were no other similar cases rendered this diagnosis improbable, and I did not consider that bathing too soon after a meal had any bearing on the cases.

Treatment consisted of the application of hot water bags, brandy to cope with shock and collapse, and castor oil. Next day, January 17, the patients' conditions were as follows: Mrs. A. and the children X. (8) and Y. (11) had practically recovered. Z. (12) was quite well. M. (6) and N. (8) were still vomiting and had occasional diarrhoea. N. recovered completely during the next twenty-four hours. A., a child with a history of a "weak" stomach, did not keep down her castor oil and was given calomel. She did not recover for four days and was given a mixture of rhubarb and soda.

Subsequently, on further questioning the parties, I was informed that on January 16, the day previous to their illness, tinned salmon had been eaten for supper at 6 o'clock. All had partaken of it, except Mrs. B. and the child Z. The former was not ill, and the latter's symptoms were anomalous.

Comments.

1. The symptoms, course and recovery in all the cases except that of Z. were those of food poisoning.

2. The only possible cause of the poisoning appeared to be the tinned salmon taken twenty-one hours before the onset of the symptoms.

3. This period seemed unduly long if the free bacterial toxins were already present in the salmon before the tin was opened.

4. It is to be presumed that no living bacteria can exist in tinned food that has been subjected to a superheating process.

5. The toxins of the food poisoning bacteria of the *Salmonella* group are resistant to heat; and in bulk handling of tinned foods an odd tin may not reach the required temperature to kill all the bacteria.

6. May it not also be possible for the organism to have been in the spore state, accounting for the long incubation period?

Acknowledgement.

I would like to thank Dr. L. B. Bull, of the Adelaide Hospital, for reading through these notes and commenting on them.

TWO OBSTETRIC CASES.¹

By E. BRETtingham MOORE, M.B., Ch.M. (Sydney),
Hobart.

Case I.—Eversion of the Uterus.

In reporting this case of eversion of the uterus I will begin by drawing your attention to the extreme rarity as given by various authorities. For example, Whitridge Williams quotes Beckman, of St. Petersburg Lying-in Hospital, and Madden, of Dublin. The former had no record of a case in 250,000 labours, the latter one case in 190,883. This does not seem to be borne out by my own experience, as I know of three other cases attended by gentlemen now present, one of which presents such unusual features that I should like Dr. T. Butler to add it to my own in this report.

Clinical History.

This was in a patient attended for her first confinement by a *confrère* of mine. As he will assure you, this confinement was in every way a normal one. Low forceps had been applied and an easy delivery effected of a 2.5 kilogram (five and three-quarter pound) child. Twenty-five minutes later an attempt was made to express the placenta, when suddenly the placenta with the *fundus uteri* prolapsed through the vulva. The woman lost a lot of blood and was also very seriously and immediately shocked.

When I arrived about fifteen minutes later the bleeding had practically stopped, but the patient appeared almost moribund. The uterus, including the cervix, was firmly contracted, and replacement, though attempted, was impossible.

In view of the woman's condition I did not feel justified in delay, and I proceeded with the instruments at hand, that is, three artery forceps, a pair of scissors and a scalpel, to amputate the uterus at the level of the internal os.

I split the uterus anteriorly in the mid-line down to the reflection of the bladder, after peeling off the placenta, and was thus able to clamp the vessels in the broad ligament. I tied the uterine arteries as I came to them, and when the body of the uterus was removed I returned the stump to the vaginal vault after putting one stitch to hold the anterior and posterior lips together.

The patient's condition almost immediately began to improve, and by 9 a.m. next morning (in six hours) seemed to be out of immediate danger. Her recovery was uneventful and she left hospital on the seventeenth day.

The infant was weaned from birth owing to the fact that the mother had been an inmate of the sanatorium some twelve months previously.

¹Read at a meeting of the Tasmanian Branch of the British Medical Association, March, 1933.

Comment.

Some views on the prognosis and treatment may be interesting. With regard to the former, Horman states that two-thirds of the patients die from shock within the first few hours. Beckman, before quoted, gives the mortality at 14%—rather exact figures for such an unusual condition.

The immediate treatment recommended is reposition, but if this fails no guidance is given.

I think repeated and unsuccessful attempts can only increase the shock, but even on consideration after the event I fail to see any other way out, except subtotal hysterectomy, if the uterus is firmly contracted, as in this case.

Case II.—Fœtal Ascites.

The patient was in a ward at the Queen Alexandra Hospital, under the care of Dr. Christine Walch, who has kindly supplied me with the following notes.

She was a *multipara* of thirty-five years in her seventh pregnancy. She gave a history of large babies (one of (?) fourteen pounds) and difficult deliveries. Her first child was still-born, with an enlarged stomach. The patient attended the ante-natal clinic on May 3, saying that she had felt no movements for three weeks. The uterus was very large and felt hard and full; no heart sounds were heard, and the fœtal parts could not be distinguished. She had a little albuminuria and no œdema.

She was advised to come in for quinine induction, and did so on the following day. She came into labour at once and progressed normally until the head appeared on the vulva, when no further progress was made for an hour, though she was having good pains.

Dr. Walch was sent for and arrived in time to see the nurse deliver the head with considerable difficulty, though it was not large. The nurse then tried to deliver the shoulders and was unable to do so.

Dr. Walch also tried, and found the neck and shoulders hard and rigid, and was quite unable to free the shoulders. She anesthetized the patient and tried again without success.

Dr. Walch then called me in and explained the case. I found the head of a large macerated fœtus protruding from the vulva and practically immovable. Finally, with the aid of a blunt hook, I was able to rotate the anterior shoulder from under the symphysis and deliver each shoulder in turn. I was, however, unable to make further progress with strong traction.

I then introduced my hand along the anterior surface of the infant and felt an enormous abdominal swelling. To make sure that the cord was not unduly short, I drew a loop down, when, to my surprise, it came away at the umbilicus. I asked for a long-handled scissors to be boiled up and, while waiting, tried traction once more, and this time with success. There was progressive yielding and finally the delivery was effected, accompanied by an enormous rush of water and a fountain from the umbilicus. The delay was occasioned by a tremendous ascitic collection; the fluid—no doubt with some *liquor amnii*—half filled an ordinary bucket.

The *post mortem* examination of the child showed generalized œdema and effusion. The right kidney was normal, but the left one was dilated, with its ureter, owing to a congenital atresia of the uretero-vesical opening.

Reviews.

SURGICAL ANATOMY.

ALEXANDER LEE MCGREGOR, in the preface of his "Synopsis of Surgical Anatomy", states that "the book has been written with the object of presenting anatomical facts of practical value to the senior student and practitioner."¹ This short sentence is the keynote of the whole work, and it is the close adherence to this plan which gives the work so much value. The author has selected a large

number of anatomical facts and has written a short essay on each, showing their clinical importance and practical utility. In this way he has bridged for the student, the teacher and the practitioner the hiatus which at present exists between anatomy, a science, and anatomy of clinical medicine.

The author stresses not only the anatomy of the dissecting room, but also the anatomy of surgery. He emphasizes the work of Reeves on the blood supply of the duodenum, of Hartman on the sigmoid, Flint on variations in the biliary passages and the function of muscles and methods of testing their clinical activity. This review of surgical anatomical literature adds much to the reader's pleasure and enjoyment and to the value of the work.

The author is to be congratulated on his style, his selection of diagrams, and on the manner of presentation of his facts. Every chapter is self-contained, and the book is singularly free from misprints. We think that on page 74 he has erred in giving the credit of stating that all indirect herniæ are congenital to Russel Howard; surely priority belongs to Hamilton Russell?

Sir Harold J. Stiles states in a foreword that the "book supplies a want and that it will be welcomed alike by the student, the surgeon, and the teacher of surgery", and with this we whole-heartedly agree.

MORTAL MAN IN HISTORY.

In all probability few people stop to consider how the diseases of the chief actors on the stage of history have influenced the feats of these actors or what effect, if any, they have had on the history of the world. The late Charles MacLaurin, of Sydney, in his well known book, "Post-Mortem", studied several of the world's most notable people and achieved certain success in so doing. Dr. James Kemble, in "Idols and Invalids", has undertaken the same kind of study and has produced a fascinating work.¹ His title is attractive and euphonious; it therefore serves well enough. But not all of his historical personages were idols; many of them achieved notoriety rather than fame. However, this may be allowed to pass.

In his preface the author divides people broadly into two categories, good and bad. He would confirm the virtue of the former and expose the imposture of the latter. If people are what the author calls bad because of their health, they cannot be looked on as imposters. He admits that sometimes a claim may be advanced that people are impelled by some circumstance of health or of environment over which they have no control and by reason of which they may fairly be entitled to extenuation or exoneration. It is along these lines that he has largely conducted his investigations. In his interpretations the author obviously tries to be just, though sometimes his imagination runs away with him; he reveals an understanding of human nature, and he is kind.

The first person dealt with is Byron. His talipes is discussed as well as the influence of this physical defect on his life and temperament. "Had it not been for his lameness, Byron might have proved one of Britain's illustrious soldiers instead of her most accomplished lover." He was indeed a *bon viveur*; he paid the penalty by dying in uræmic coma. "He squandered his health and spent his resources. But what a liberal legacy remained in his poetry." Christopher Columbus is labelled on circumstantial evidence with a diagnosis of syphilis. His sailors brought syphilis back to Europe with them from the New World, and the "Spanish disorder" spread far and wide. Columbus, in the author's opinion, was infected, and his mental and bodily illnesses are shown as likely to have been caused by the *Spirochæta pallida*. Judge Jeffreys had a stone in the bladder, a condition calculated to upset the equanimity, the judicial calm, of any occupant of the bench. Louis XV is discussed in his relations with the Nesle sisters, Madame de Pompadour and Madame du Barry. He died of smallpox. The Borgias come in for a searching investigation. Pope Alexander VI, Cesare and Lucrezia are in turn exposed to cold scrutiny—the result of the scrutiny may easily be imagined. It is

¹"A Synopsis of Surgical Anatomy", by A. L. McGregor, M.Ch., F.R.C.S., with a foreword by Sir H. J. Stiles, K.B.E., F.R.C.S.; 1932. Bristol: John Wright and Sons, Limited. Crown 8vo., pp. 623, with illustrations. Price: 17s. 6d. net.

¹"Idols and Invalids", by J. Kemble, Ch.M., F.R.C.S.; 1933. London: Methuen and Company, Limited. Crown 8vo., pp. 221. Price: 6s. net.

noteworthy, however, that the author will not regard Lucresia as of the same villainous type as Alexander and Cesare. The chapter on Cleopatra is styled "Love and Eugenics"; here a new light is thrown on this fascinating queen. "The Medical Life of Lord Nelson" is interesting. Henry VIII, of course, is dealt with; it would be difficult to imagine a book of this kind without a chapter on this much married monarch. The author lays bare Henry's syphilis, but is far from unkindly in his judgements. The last person to be discussed is "poor Anne Stuart". She was "like the old woman who lived in a shoe, she had so many children; but, as she didn't know what to do, they all died". The conclusion that she was homosexual is the outcome of the author's imagination. A woman who had so many children would not have homosexual inclinations. We fear the author has maligned "poor Anne Stuart".

This book is recommended to readers of this journal as one that will hold their interest from start to finish, though the author's English is by no means above reproach. It may also be recommended to the discerning among the laity; its medicine is not too technical. The publishers deserve a word of praise; the paper, printing and general make-up of the book are excellent.

A HANDBOOK ON THERAPEUTIC PNEUMOTHORAX.

To many, no doubt, it will appear surprising that a text book of 170 pages should be written on such a limited subject as artificial pneumothorax. The increasing vogue which this treatment now enjoys in pulmonary tuberculosis is ample justification, however, for such a treatise, especially when written by a master of his subject, such as Dr. L. S. T. Burrell.¹

In the opening sentence of the preface he states the *raison d'être* of the monograph: "This book is written for the general practitioner who wants to undertake treatment by artificial pneumothorax himself or to know what type of patient is likely to benefit from having the lung collapsed by this or some other method."

The author's objective is to "convince the practitioner not only of the value of artificial pneumothorax as an adjunct to other methods of treatment, but also of its safety and the ease with which it may be conducted". It must be at once admitted that no practitioner who reads the book can fail to be convinced of this latter statement of Dr. Burrell.

After a short explanation of the principles underlying pneumothorax treatment, the author describes various forms of apparatus. The technique of induction of pneumothorax is discussed in detail, including gas replacement and pleural lavage. Emphasis is wisely laid on the need for avoidance of any elaborate preparation and ritual, as having a bad psychological effect on the patient.

The chapter on "Indications and Contra-Indications" is the most important in the book. It reflects the author's long experience and well-balanced judgement. The wide applicability of artificial pneumothorax is worthy of note, though for lung abscess it is not recommended. The advice given in this chapter is sound and should be in the knowledge of every practitioner of medicine.

The technique of refills is explained. The author's statement, "the object of artificial pneumothorax is to rest part of the lung by keeping it collapsed and the degree of collapse should be kept constant", though true, is an impracticable ideal. Nevertheless, there must be general concurrence with his condemnation of the "concertina method" of going from almost complete expansion to complete collapse with each refill. A *via media* must be found, suitable to the individual case, whereby "the patient is most free from symptoms".

To those who think that this treatment should be included forthwith in their therapeutic armamentarium, the author sounds a note of warning: "The easiest part of artificial pneumothorax treatment is putting a needle into the pleural cavity and injecting gas, but the most

difficult by far is knowing how much to give and how often to give it." Such knowledge can come only from experience.

At first sight it is alarming to find 50 pages devoted to complications. But one third of this space is occupied in dealing with pleural-effusion which is frequent in its occurrence, at least in small amounts, and is usually negligible. The author does not recommend gas replacement as a routine treatment. Oleothorax receives mention in this connexion. For the more serious but rare condition of tuberculous empyema, active treatment is demanded in an endeavour to obtain reexpansion of the lung.

Other infrequent complications such as pleural shock, surgical emphysema and displacement of mediastinum, receive due mention. In "Bilateral Artificial Pneumothorax", Burrell recommends reexpansion of the first lung before collapse of the second is caused. There is no doubt this is the safest method. Selective and double partial pulmonary collapse he does not recommend. In a bilateral case, rather than perform a double pneumothorax, he prefers to bring about collapse of the worse lung, and to give "Sanocrysin" at the same time. Here may be noted with approval the aggressive policy of the modern pulmonary physician. The *laissez faire* attitude of older times has passed.

It is a point well made, that temporary collapse, of even a few months, often encourages the formation of fibrous tissue, converting a progressive tuberculous lesion into a healing one. The author finds few indications for cauterizing adhesions, but many for phrenic avulsion. This operation is gaining in favour, and it appears to be established as a simple and safe procedure. "I have not seen one mishap in any of my cases", remarks Dr. Burrell.

A brief summary is given of modern views on the important operation of thoracoplasty. The dictum is sound that "a good thoracoplasty is better than a bad pneumothorax, but a good pneumothorax is infinitely better than a thoracoplasty". Whether there are many surgeons competent to perform "a good thoracoplasty" is another matter. Certain it is that Dr. Burrell is on safe ground in his contention "Thoracoplasty is in the domain of the specialist rather than of the general surgeon, and it is important to select one who has special experience of the operation".

A number of interesting skiagrams is illustrated. One case deserves mention, wherein a dislocated trachea and extensive fibrosis suggest the futility of artificial pneumothorax, but, nevertheless, a complete collapse was obtained, showing that this treatment should always be attempted if indicated on clinical grounds, though X ray findings suggest there is but remote chance of success.

There is much excellent advice in the chapter on "Termination of Treatment". A minimum of three years is advised with a fourth "of probation", wherein the lung is not allowed to reexpand completely.

It is admitted that a very partial collapse is not worth maintaining. On the other hand, the author has found some of his most successful cases among patients in whom the treatment, owing to obliteration of the pneumothorax cavity by adhesions, was limited, often to a few months. He recognizes the need, at times, of continuing artificial pneumothorax for psychological reasons.

After giving a summary of 671 cases in which he induced artificial pneumothorax, the author concludes: "It will be seen, therefore, that accidents and complications of the treatment are few and that one can appreciate the feeling of security which so many patients feel when being treated by artificial pneumothorax."

This is a readable and concise manual, entirely fulfilling the purpose for which it was written. It can be commended to all who are interested in one of the most remarkable therapeutic advances of modern times, namely, collapse therapy in pulmonary disease.

"THE HOME OF MANKIND": A CORRECTION.

In the issue of August 5, 1933, we published a review of "The Home of Mankind", by H. W. Van Loon. By an oversight the name of "Moore's Book Shop", Sydney, was omitted from the footnote. The book is obtainable from Mr. Moore, price fifteen shillings.

¹"Artificial Pneumothorax (Practitioners' Series)", by L. S. T. Burrell, M.A., M.D., F.R.C.P.; 1932. London: William Heinemann (Medical Books) Limited. Demy 8vo., pp. 181, with illustrations. Price: 12s. 6d. net.

The Medical Journal of Australia

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CANCER.

EWING defines a tumour as an autonomous new growth of tissue. He points out in his well known book on neoplastic diseases that among most authors there is virtual agreement regarding the essential parts of the definition of tumours. He quotes the definitions of many authors. In practically all these definitions the atypical structure is mentioned, as well as spontaneous origin and absence of function. Borst is stated to have laid emphasis on the "atypical morphology and biology" of tumours. Ewing goes on to declare that the nature of tumour growth is different from that of the normal tissues and from inflammatory hyperplasia and is something new and foreign to the organism in which it occurs. An understanding of tumour growth is impossible without some satisfying basal conception of tumour growth. A well known Australian pathologist, on being asked his opinion of the nature of cancer growth, parried the question by asking why normal growth took place,

why regeneration of tissues occurred in a normal way, and why healing stopped and further tissue was not produced. The pertinence of this question becomes evident on reading the latest communication from G. W. Nicholson, Professor of Morbid Anatomy of the University of London, at Guy's Hospital.¹

Professor Nicholson begins by admitting the commonly accepted statement that tumours are disturbances or morbid forms of growth. He adds that growth is a function of living organisms, whatever form it happens to assume. He states that tumours can be looked on either as inherent variations caused by germinal factors, inaccessible for prevention, or as due to external conditions, possibly preventable with prophylactic measures. In other words: "Tumour formation is the visible expression of an innate, general or local, anomaly of the 'make-up' of an individual who is predestined, so to speak, to develop the tumour; or the result—inevitable indeed like all results—of a change to which a normal individual is, or was, 'accidentally' exposed." If the first of these views is correct, Nicholson can see nothing further to be said; if the second view is correct, the relationship of innate composition and external conditions needs to be understood as well as the differences of the mechanism of normal and morbid growth. In discussing the relationship of physiology and pathology, he points out that pathology is concerned entirely with manifestations of life; it is part of biology. A microorganism, such as the bacillus of tuberculosis, is not the "cause" of disease. All that the bacillus does is to incite the organism to so-called unphysiological behaviour ("as if behaviour could ever be other than physiological"). "It does this in proportion to its own greater or lesser degree of virulence, as we are told, although it does not always succeed even in this. The living organism *determines* the disease and its form." Every living phenomenon is the result of the interaction of factors of two kinds: factors which determine the phenomenon in time, but not in form or kind (factors of realization or stimuli), and factors which determine the specific kind or form of the phenomenon (factors of determination).

¹ Guy's Hospital Reports, April, 1933.

The easier half of the problem of causation, and no more, is solved when a specific stimulus is demonstrated. Causation is thus reduced to a problem in physiology. The reactions of pathology are to Nicholson natural, biological and entirely physiological.

Nicholson discusses the teaching of the preformationists, the views of Weismann and the genetic theory in an argument that cannot be reproduced here. He concludes that the cell of the multicellular organism does not contain within itself all the elements of its determination and that ontogeny is not completely determined in the egg. In application of his views he states that every part of the body, the head, for example, is determined in part by innate composition of the ovum, but in part too by external factors of realization which exist outside the egg altogether and happen to occur at the right moment. Absence of some or all of these factors of realization will result in an incomplete or malformed head or in complete absence of the head. "And these things will happen when the ovum is perfectly healthy or normal to begin with." When an hereditary factor is demonstrated, Nicholson would trace this factor to external conditions in a former generation. His final definition of tumour formation is that it is a reaction to stimulation comparable with every reaction of the organism or cell, which differs from these in degree, but in principle not at all. Tumour formation is a reaction, an innate physiological potency or capacity, of every dividing cell, and represents and is the innate physiological function of growth by division.

Whether Nicholson's views will gain general acceptance need not concern us at the moment; they will probably be debated in many quarters. There is no doubt, however, that he has offered much food for thought. It must be acknowledged that the idea of growth as physiologically identical in normal and tumour tissue and of pathology as an extension of physiology makes tumour growth more easily understood. The factors of realization, the stimuli to tumour growth, are being gradually discovered. To ascertain the factors of determination is much more difficult.

Current Comment.

FEBRIS UVEO-PAROTIDEA.

In 1909 Heerfordt described a clinical syndrome consisting of uveitis, parotid enlargement and, usually, fever; the disorder was more or less chronic and was frequently complicated by paralysis of the facial nerve, sometimes of other cerebro-spinal nerves. Heerfordt named it *febris uveo-parotidea*. Other names, such as "uveo-parotitis" and "uveo-parotitic paralysis", have since been used. Most observers have expressed the opinion that the condition is tuberculous. In a recent interesting and carefully prepared paper, Hugh G. Garland and J. G. Thompson have reviewed the literature and reported a case.¹ They have no doubt concerning the tuberculous origin of the disorder, and they suggest the name "uveo-parotid tuberculosis". They have discovered reports of 46 cases; their own brings the total to 47. Most of the patients were in the second and third decades of life. There was bilateral parotid enlargement, not always symmetrical, in 45 cases, and unilateral enlargement in two. The glands are firm and nodular; there is seldom any pain; occasionally there is tenderness to pressure. Suppuration does not occur, and the glands do not become adherent to the overlying skin. The swelling slowly subsides after a period varying from two weeks to three years. There is no tendency to relapse, but the glands may be permanently indurated. Bilateral uveitis is a feature of every case. Usually one eye is affected before the other. Irido-cyclitis is an outstanding manifestation; posterior synechiae commonly develop, and often there are permanent pupillary changes, such as fixity, irregularity of outline, and inequality. Tuberculous nodules on the iris have been noted. Vitreous opacities have been noted in half the cases; permanent impairment of vision is common; total blindness may occur. The uveitis usually persists longer than the parotitis, and it tends to relapse; in one case there was a relapse after a period of two years. Facial palsy occurs in about 50% of cases; it is almost certainly due to involvement of the nerve in the parotid lesion. Other nervous disorders occur, but they are not common. Fever is not a constant symptom; apparently it is never very high, and seldom prolonged; when it does occur, it may be limited to the prodromal period. Three of the 47 patients died of miliary tuberculosis. The examination of portions of the parotid gland removed at biopsy or autopsy reveals histological evidence of tuberculosis. Garland and Thompson lay stress on the remarkable similarity in the type of tuberculosis revealed by histological examination; apparently in every case the features are endothelial fibrosis and absence of caseation. They regard this as further support of their view concerning the aetiology. In a number of cases there was no reaction to the von Pirquet test; but, as Garland and Thompson point out, this can-

¹ The Quarterly Journal of Medicine, April, 1933.

not be accepted as conclusive evidence of the absence of tuberculous disease.

There is little doubt that this disorder is tuberculous; sometimes it is a manifestation of generalized tuberculosis; it may more often be a complication of tuberculosis elsewhere. The incidence is probably considerably higher than is implied by the number of reported cases. Tuberculous irido-cyclitis is a well known disorder; possibly it is often part of a condition of uveo-parotid tuberculosis.

THE USE OF BRAN AS A LAXATIVE.

ALL readers of that section of the Press which caters for the demand for popular articles on health must have seen references to the value of roughage in the diet. Various preparations of bran are also widely advertised, and their virtues as a laxative are extolled. Incidentally it may be remarked that one cannot pick up a popular magazine now without realizing that reticence is not a characteristic of modern advertising. But in addition, the members of the medical profession frequently prescribe articles of diet which add to the cellulose content of the bowel, in order to overcome chronic constipation without the constant administration of aperient drugs. Probably few really accurate studies of the effects of such substance have been made. Of course the indications and contraindications for them are recognized widely, for it is apparent that it is not always advisable to add to the bulk of the colonic contents, and more particularly to irritate the mucosa. George R. Cowgill and Albert J. Sullivan have made previous investigations into the effect of bran when taken in the food by normal persons, and now they present the results of an inquiry into the results obtained in patients who were the subjects of chronic constipation for a considerable period.¹

For the purpose of this investigation they took six men, aged twenty-five, twenty-three, forty, fifty-one, thirty-three, and thirty-five years. These persons had been constive for periods ranging from six months to twenty years. The common symptom was not due to a common cause. One man from his history belonged to the spastic colon group, and he regularly tormented his bowel with cathartics, with the usual result. Others were more of the atonic type, and in another case a sedentary life with unsuitable diet appeared to be the cause. The period of study was eight to ten weeks, and the plan adopted was as follows. The patient was first given a basal diet, such as the authors had found to be so low in fibre content (30 to 38 milligrammes of fibre per kilogram body weight) that it produces constipation in healthy men. After a six day period commercial bran was added to the diet to bring the fibre intake up to about 50 milligrammes per kilogram weight. In succeeding periods there was tried a similar diet, with the commercial bran replaced by a "processed" product (that is bran milled and

made palatable with other ingredients such as sugar), a basal diet *plus* fruit and vegetables sufficient to bring up the fibre intake to 90 milligrammes, and the same diet, but with half the previously used amount of refined bran in addition. These periods were separated by intervening breaks of six days during which the basal diet alone was used again, until constipation was once more produced. All the meals were eaten under supervision, and representative samples of the foods used were analysed for moisture and crude fibre. The amount of water in the dietary was kept at the standard laid down for himself as usual during each patient's trial basal period. Stool analyses were also made in all cases, and the bulk and weight of the dejecta were noted. In this way the amounts of fibre ingested could be compared with the amounts passed. The authors confirm the findings of other workers, who have reported that the fibre of all foodstuffs is not dealt with similarly. Thus, a great part of the fibre derived from vegetables is destroyed in the intestine, but not to equal degree in different persons, nor with different vegetables in the same person. Some patients were found to be quite well suited by a diet rich in fruit and vegetable fibre, and needed no other addition to enable them to overcome their constipation. Others again had to take bran in addition to the vegetable and fruit.

The object of the research was to ascertain if the effectiveness of bran in the food, that is, its effectiveness as a laxative, was confined to healthy and normal men, or if this effect was still obtained in the subjects of clinical constipation. The answer appears to be that bran supplies sufficient harmless vegetable fibre in the diet to overcome the degree of sluggishness of the colon commonly found in those who are habitually constive. Of course, as the authors remark, the bowel should not be burdened or irritated by indigestible material if it is already irritable, or narrowed, or ulcerated. As might have been expected, their patient with the irritable spastic colon did not find roughage in the diet a kindly or effective addition to his daily ration, and took much more happily a bland diet *plus* agar-agar. But all the other men found the bran quite satisfactory. As regards the type of preparation used, the commercial variety of bran was perfectly effective, but was not so palatable as the processed product. The processed was not quite so useful bulk for bulk as the crude stuff, probably owing to the reduction in the size of the fibre during the operation of milling. But this was offset by the taste and general agreeableness.

The most useful conclusions to be drawn from this work are that bran, either commercial or processed, really is effective in the treatment of uncomplicated constipation, and that a diet which actually contains enough residue to maintain regularity of the bowels in some persons is ineffective in others; and in these the trouble may be overcome by adding a form of roughage that experiment has proved will withstand decomposition in the colon.

¹ The Journal of the American Medical Association, March 18, 1933.

Abstracts from Current Medical Literature.

PÆDIATRICS.

Allergy and Rheumatism.

C. C. McLEAN (*Archives of Pediatrics*, February, 1933) gives a résumé of past and present theories concerning the etiology of acute rheumatism. He describes Swift's experiments with rabbits sensitized to the short-chained streptococcus. He records the incidence of allergic manifestations associated with respiratory infections in seventy-two children, thirty-six rheumatic and thirty-six non-rheumatic. Eczema, urticaria, spasmodic croup and asthmatic bronchitis were the allergic conditions inquired after, and the respiratory infections were of any degree of severity and distribution. The average age of the patients when first seen was 2.8 months; 60% of them were seen before the age of eight weeks. The average age at which the first manifestations of the rheumatic infection were seen was 4.2 years. The author found that so-called allergic manifestations were no greater in the rheumatic than in the non-rheumatic children, with the possible exception of gastro-intestinal symptoms complicating respiratory infections. The number of respiratory infections differed little in the two groups. Repeated attacks of tonsillitis were observed in 88% of the rheumatic and 77% of the non-rheumatic cases. Sixty-one per centum of the rheumatic patients developed the condition before the tonsils and adenoids were removed, and 64% had the tonsils and adenoids removed before the age of development of the infection. Twelve of fourteen rheumatic patients who had lost their tonsils before showing signs of the infection had a more or less chronic paranasal sinusitis, while only six of the twenty-three non-rheumatic children of the same category developed such sequelæ.

Atelectatic Bronchiectasis in Childhood.

R. W. B. ELLIS (*Archives of Disease in Childhood*, February, 1933) reports five patients showing the classical picture of sacular bronchiectasis concealed behind the heart shadow in the radiogram. The triangular shadow situated across the right cardio-phrenic angle was once regarded as a mediastinal effusion. In England and America the shadow is regarded as due to a primary collapse with secondary bronchiectasis, and on the Continent as mainly due to an "adhesive mediastinal pleurisy" over the bronchiectatic area. All Ellis's patients were given morphine and "Nembutal" previously, and this permitted lipiodol injection to be performed under local anaesthesia or prepared the way for a light general anaesthesia. The history and physical signs were similar in all cases. In each instance the symptoms dated

from an attack of bronchopneumonia in early childhood. The presenting symptom was cough of moderate degree. The sputum was consistently scanty and not foetid, even with postural drainage. Constitutional disturbances were also very slight, and all the patients gained weight steadily. Following lipiodol injection one boy showed some constitutional disturbance and developed hemorrhagic nephritis. The chronicity of the condition in these patients varied from five to nine years. During three to four years' hospital observation no change took place in the severity of symptoms or in the extent of physical signs. These were amphoric breathing at one base in two children and râles over the affected area in all. The heart was displaced little or not at all towards the diseased side. Clubbing was present in four of the five patients, but was relatively slight. No hemoptysis occurred. Ellis considers, however, that there is a gradual tendency for neighbouring bronchi to become affected from "spilling over" of the atelectatic sacculæ. The author has also had the opportunity of observing reexpansion of the lower lobe by breathing exercises after an acute collapse in pneumonia; he has also seen it in another case of collapse during the course of a tuberculous infection, possibly due to the pressure of an enlarged mediastinal gland. The lipiodol plates of this series support the view that it is indeed the whole of the lower lobe which is involved and the fan-like spreading of the bronchi represents a compensatory hypertrophy and emphysema which fill the whole of the chest. Ellis suggests that a complication tending to perpetuate the condition may be the nipping of the phrenic nerve in fibrous tissue, causing a partial paralysis of the diaphragm. Treatment is essentially preventive and the presence of this condition must be deliberately sought for before any child is discharged from hospital following bronchopneumonia. If evidence of the condition is found, every effort should be made to bring about reexpansion of the collapsed lobe by carbon dioxide inhalations or breathing exercises, with a long convalescence in the open air. Bronchial aspiration is of doubtful value in uncomplicated cases with scanty sputum, and lobectomy has still a very high mortality.

Diabetes in Childhood.

W. DÖHMAN (*Münchener Medizinische Wochenschrift*, December 16, 1932) states that in his investigation of diabetes in childhood he found that 48% of cases occurred between three and six years of age, 13% between seven and ten years, and 39% between eleven and fourteen years. The greater percentage occurring early in life is due to the fact that the islands of Langerhans do not keep pace with the growth of the body cells. The onset of menstruation and infections hasten the onset of diabetes. The diet the author orders consists of 10% of

the calories as protein, 60% to 65% as fat, 25% to 30% as carbohydrate. Of 23 children with diabetes observed in the last few years, 18 are in perfect health and five are dead. In three of the cases death was due to failure to keep to the diet, one patient died of tuberculosis and the other one of pneumonia.

Copper in the Treatment of Nutritional Anæmia in Infancy.

HELEN MACKAY (*Archives of Disease in Childhood*, April, 1933) has endeavoured to discover whether the milk anæmia of babies which she has previously described needs copper for its cure, since experimental workers have shown that it is required in the rat. It appears that copper does not affect the assimilation of iron, but does function in the conversion of inorganic iron into hæmoglobin. The curing of nutritional anæmia in babies by iron and ammonium citrate was, the author believes, unconnected with its copper content, as the additional copper introduced as an impurity added relatively very little to that provided in the diet. Two series of patients were treated, one with iron and ammonium citrate alone in a dosage between 0.27 and 0.54 gramme (four and a half and nine grains) daily. In a further series this was supplemented with a dose of 3.2 milligrammes (one-twentieth of a grain) of copper sulphate daily, divided into three doses. The results did not suggest that copper was of any benefit in this type of anæmia, which, it is concluded, is due to a deficiency of iron alone, not of iron plus copper. The varying copper content of dried milk was taken into consideration and was as high as 0.25 milligramme of copper per litre of reconstituted milk, as compared with 0.123 to 0.184 milligramme of copper per litre of fresh milk as estimated by Elvehjem, Steenbock and Hart by the same technique. The author concludes that copper deficiency plays no part in the great majority of cases of nutritional anæmia of infancy seen in London and that this probably holds good for other parts of the world.

The Periodic Group of Disorders in Childhood.

W. G. WYLLIE AND B. SCHLESINGER (*The British Journal of Children's Diseases*, January-March, 1933) draw attention to the common repetition in childhood of attacks of periodic headache, vomiting, fever and abdominal pain. They point out that not all symptoms are equally prominent in every case, but that usually one is predominant and the others are often elicited only by inquiry. Most cases begin in the child's third or fourth year, and, seen in a first attack, the children may present a knotty diagnostic problem. Various names are given to the syndrome—"cyclic vomiting", "bilious attacks", "migraine" *et cetera*—which have no scientific value. Sometimes the disorder persists in adult life as migraine. All forms are alike in the abruptness of their onset,

though preceding the attack there is often a brief period of malaise and lassitude comparable with an aura, which warns the observant parent of the impending storm. Ketosis, obvious in all by smell alone, can be chemically detected in many pyrexial and migrainous types. The authors record 80 cases. Vomiting was specially mentioned in 63 instances, headache in 60 instances, while abdominal pain was present to some degree in most cases. Limb pains were common and urticaria and asthma occurred in a few. Vertigo was complained of by twelve children, lapses of consciousness without any convulsive element were observed in seven children. Reference is made to the finding of raised blood pressure in several, most often with headache, vomiting, and especially vertigo. One child under four years registered a systolic blood pressure of 110 millimetres of mercury, and one of eight years 140 millimetres. The children were for the most part of a nervous type and a large number had a familial history of migraine or biliousness, while asthma occurred in a considerable percentage of such families. Skin reactions of the routine order were performed on eight children and showed no abnormality in six. The authors also compared the effects of a ketogenic diet and the results of liver function tests (adrenaline, levulose tolerance) on them and a group of normal children, from the results of which they conclude that the underlying factor in the periodic group of disorders is of nervous rather than of hepatic origin.

ORTHOPÆDIC SURGERY.

Intravenous Vaccine Therapy in Acute Rheumatism.

W. R. F. COLLIS AND W. SHELDON (*The Lancet*, December 10, 1932) describe their treatment in acute rheumatism in children. The child is first submitted to thorough clinical examination, and the weight, throat culture, sedimentation rate and degree of skin sensitivity to hemolytic streptococcal extract are recorded. If the child is found to be in the inactive or convalescent rheumatic state, intravenous vaccine therapy is commenced. Very small doses are used to begin with, 50,000 or 100,000 organisms being used at the start. Small daily doses for four days, with an interval then of five days before the next injection, were given at first, but this method was abandoned, as the effect of the vaccine was cumulative and difficult to judge. Eventually injections were given once a week or every fifth day. These experiences find a close parallel in the experimental work of Swift, who found that when animals had been sensitized by intradermal, subcutaneous or intramuscular injections of bacteria, their sensitivity could be maintained by the artificial production of a septic focus, such as an infected agar tumour. Such animals succumbed to further injections

of bacteria in doses which were sublethal for normal or immune animals, and the sera of such animals contained no immune bodies against the organisms used. It was, however, possible to desensitize these animals by gradually increasing doses of bacteria given intravenously, and then their sera could be shown to have developed immune bodies.

Treatment of Joint and Bone Tuberculosis.

R. STITCH (*Münchener Medizinische Wochenschrift*, March 10, 1933) writes that tuberculosis of the skeleton, if treated conservatively, requires years of treatment, and that every intercurrent infection can cause a relapse. The so-called radical operations for bone and joint tuberculosis cannot always remove all of the diseased tissue. Sometimes a subtotal resection will suffice to heal the tuberculous focus. Exact resection of a tuberculous joint is often very difficult. The majority of German surgeons operate when big extracapsular bony foci are present, and also early in foot and knee joint tuberculosis not responding rapidly to conservative therapy. The author does not hesitate to do resection operations in older children and adolescents, but only operates on synovial tuberculosis when long conservative therapy has failed. The supporters of operative therapy argue that they obtain the same results in four to five months as with conservative therapy of four years; in other words, a stiff joint is almost always the end result of treatment. Furthermore, an ankylosed joint after operation is preferable to a partially movable and painful joint after conservative therapy. The author operates less frequently on the hip and spine, since hip operations are more difficult than the knee and foot operations.

The Stiff Joints of Chronic Polyarthritides.

BURKHARDT (*Deutsche Medizinische Wochenschrift*, November 25, 1932) writes that the use of local anti-rheumatic drugs (salicylates, sulphur and iodine) can no longer cure the stiffness of chronic polyarthritides. They produce only a local hyperæmia and analgesia of the neighbouring joint tissues. The necessary treatment is early mechanotherapy—pressure and traction with suitable movements. *Brisement forcé* and sudden corrections must be avoided. In very old stiff joints the joints should be encircled with analgesic injections (1% "Novocain") and then energetic movement exercises carried out. Such injections are especially useful for large joints if carried out in courses of four to six weeks. The small finger joints often necessitate monotonous individual work to produce a useful joint. In still active joints the author injects antiarthritic drugs around the joint (formic acid, "Atophan", "Cylotropin", combined with an analgesic drug). Bee poison ("Apikosan" or "Immenin") injected in the form of five to ten wheals repeated three to

five times directly over the skin of the stiffened joint has proved very beneficial. Early movements are most essential in every form of chronic joint disease. Immobilization of the joint is indicated only in very few cases, mostly acute traumatic or specific infections of joints. Early passive movements and thence active movements must be insisted upon. In addition, all other methods of treatment must be used: treatment of focal infections, diet, and a reassurance of the patient as to his condition and the outcome.

Spondylitis Traumatica (Kümmell).

K. SCHREINER (*Münchener Medizinische Wochenschrift*, April 21, 1933) reports a case of *spondylitis traumatica* occurring seven years after an accident where masses of stone fell on to the patient's neck, resulting in a fractured sternum and a probable fracture of the eighth thoracic vertebra. Pathologically the disease is characterized by a softening of the spongiosa of the vertebra, often through minor injuries, which cannot always be shown radiographically. The disorganization of the spongiosa is then followed by a collapse of the vertebra with curvature of the spine or gibbus formation after a variable time. Matte and Stahl regarded it as due to too early weight bearing on the not firmly healed bony fracture. However, in 1,017 cases of spine injuries treated with early movement and weight bearing, Haumann and Magnus did not observe one case of Kümmell's disease. Magnus regards the wearing of the supporting corset as causing weakness of the spinal musculature and ligaments and the disappearance of the bony calcium as responsible for the origination of many cases of Kümmell's disease. Kümmell discriminates three developmental stages in the course of the illness: (i) shock with short period of local continuous pain of the spine; (ii) the essential well-being of the patient with the resumption of his occupation; (iii) the gibbus formation with fresh recurring pains after weeks or months. These three stages occurred in the author's patient, although the second stage lasted only fourteen days and rapidly passed into the third stage with the collapse of the vertebra and girdle pains.

Hyperparathyroidism.

WALTER BAUER (*The Journal of Bone and Joint Surgery*, January, 1933) considers that hyperparathyroidism is a distinct disease entity. He describes an elevated serum calcium content and an increased calcium excretion, which is entirely urinary, the fecal excretion being unaffected. He states there is also an increased phosphorus excretion which is also entirely urinary, and that there is a decrease in the level of serum phosphorus. He considers that the condition is generally due to a parathyroid adenoma, but does not agree that arthritis or Paget's disease is associated with it or due to it.

British Medical Association News.

SCIENTIFIC.

A MEETING OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the Medical Society Hall, Albert Street, East Melbourne, on April 5, 1933, Dr. W. G. D. UPJOHN, the President, in the chair.

The Causation of Cancer.

DR. THOMAS CHERRY delivered an address, illustrated by lantern slides, entitled: "A Survey of Recent Work in the Causation of Cancer" (see page 197).

DR. G. WEIGALL asked if there were any statistics concerning the incidence of cancer among patients suffering from tuberculosis, and, on the other hand, concerning the history of previous tuberculosis in patients developing cancer in later life.

In reply, Dr. Cherry said that there were no statistics dealing especially with this question. The English records he had quoted threw indirect light on it and the conclusions he had drawn were inferential. *Post mortem* records showed that the coexistence of cancer and active phthisis was rare, and in regard to the signs of cured tuberculosis, results had been published both for and against the association by different pathologists. Since it had been known that he was interested in the correlation between tuberculosis and cancer he had heard from his friends and colleagues of many histories of families illustrating this association, and he had thus had the opportunity of studying the details of more such histories than would fall to the lot of most medical men.

DR. W. OSTERMEYER congratulated Dr. Cherry on his lucid expositions of so many aspects of a most difficult and complicated subject, and asked for information on the biochemical aspect of cancer metabolism, particularly as regards the salts found on the incineration of cancerous tumours.

Dr. Cherry suggested that Dr. Wright, who was working on this aspect of the problem, might give them an outline of his results.

DR. R. D. WRIGHT remarked that the examination of the salts of cancerous tissues had been investigated by two methods: (i) That of the analytical chemist, using large pieces of tumour tissue which were calcined, the metallic salt content of the ash being estimated quantitatively. No significant difference had been found constantly between neoplastic tissues and normal tissues by this method. (ii) The method of incineration of sections of the tissues prepared for cutting without removing any of the salt content and examination being made by dark ground illumination. These were like the usual sections which were stained for microscopic examination. When they were incinerated the nucleus of a cell was found to carbonize more slowly than the protoplasm. The salt ash which was left on the slide after complete carbonization was concentrated round the nuclear region. Qualitative estimation of the metals in it was difficult; the reactions which took place between it and the glass of the slides were, as far as Dr. Wright could find, unknown. The effect of these reactions in making the salts show up in dark ground illumination was unknown. It had been stated by the originator of the technique, Pollicard, that the salts of sodium and potassium were volatile at the temperature of incineration, about 650° C., so that the remaining salt was mostly calcium. This was definitely not the case.

The distribution of the salts round the nuclear zone had been mentioned. This finding did not necessarily mean that the salts were distributed thus in the cell. It might be that they were concentrated here because the nuclear region was the last to be incinerated.

There had not been published, unless very recently, any evidence from this examination that neoplastic cells differed in salt content from normal cells of the same category. Difference of the breast carcinoma cell from the stroma cell had been demonstrated.

DR. W. G. D. UPJOHN asked if there had been any work in mice or other animals of a tuberculosis or cancer resisting stock.

Dr. Cherry said that when dealing with a new stock of mice, although at first there might be a certain number of spontaneous tumours, these tended soon to die out if the mice were kept under good conditions in the laboratory, and in such a stock very few spontaneous tumours would arise. This suggested the possibility that mice bred by the dealers under poor conditions showed a greater tendency to tumour formation than those bred under more ideal conditions in the laboratory.

DR. D. M. EMBELTON asked whether any attempt had been made to protect mice against the effects of injections of tubercle bacilli by preparations such as "C.S.B.", used in the immunization of calves *et cetera*.

In reply, Dr. Cherry said that he was not aware of any work done in this direction in the case of mice, which were naturally very resistant to tuberculosis, but prone to cancer. The rabbit, however, was an example of an animal resistant to both tuberculosis and cancer.

DR. WALTER McC. RUSSELL asked if mice in the natural state died frequently of tuberculosis or cancer.

In reply, Dr. Cherry said that both were rare causes of death in mice and that cancer was exceedingly rare among wild animals generally, its incidence being low even among animals in the Zoological Gardens.

In concluding the meeting the President expressed the very great appreciation of those present of Dr. Cherry's original and important address, and he hoped that it would be published in due course so that a wider circle of members would have the benefit of the valuable information contained in it.

A MEETING OF THE NEW SOUTH WALES BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the Renwick Hospital for Infants on November 17, 1932. The meeting took the form of a series of clinical demonstrations by the members of the honorary staff.

Congenital Pyloric Stenosis.

DR. HOWARD BULLOCK showed two typical cases of congenital pyloric stenosis. These were treated by the usual Ramstedt's operation. Dr. Bullock discussed the diagnosis and after-treatment. Both infants were now up to the normal weight and size for children of their ages.

Congenital Dislocation of the Hip.

Dr. Bullock next showed two patients with congenital dislocation of the hip, who were still under treatment. These were treated by manipulation under anaesthesia and the application of plaster. One child was still in plaster, the other was having massage and reeducational movements.

Stricture of the Rectum.

DR. GORDON LOWE showed a child, aged seventeen months, who was suffering from stricture of the rectum. The child had been discharged from hospital after pertussis; at the time of the patient's discharge he was passing more or less normal motions. He returned three days later, having been obstinately constipated. There was a history of the passage of blood on two occasions and of vomiting once. Examination revealed a mass in the rectum. A small orifice was felt; a catheter was passed, but it was found to be impossible to wash out the bowel. Laparotomy was performed and it was found that the pelvic colon was dilated and contained large faecal concretions. Subsequent treatment consisted in the passage of Hegar's dilators and in manual dilatation for a period of twelve months. At the time of demonstration only a slight band could be felt in the wall of the rectum, and this was causing no discernible obstruction.

Inguinal Hernia and Gangrenous Ovary.

Dr. Lowe also showed a child, aged seven weeks, who was admitted to hospital on March 21, 1932, with a swelling

on the left labium. The swelling had been present for two days. Since birth there had always appeared to be some swelling on the left side. The swelling became larger and red in colour. The swelling at the time of the patient's admission to hospital was both red and tender and appeared to be fluctuant at the lower end. Operation revealed a firm, hard, gangrenous ovary in a hernial sac. The ovary was removed and the hernial sac was closed. The child was discharged from hospital with the wound healed on April 7, 1932.

Nævi.

DR. T. Y. NELSON showed three patients suffering from nævi which had been treated with sodium morrhuate injections. These were in various stages of healing and showed the gradual shrinkage in the vascular tumour caused by the thrombosis.

Cystic Hygroma.

Dr. Nelson also showed a child who was suffering from a cystic hygroma. He said that these cysts were lined by endothelial cells. They had friable walls and were characterized by an increasing liability to hæmorrhage. The cyst extended from the lower jaw to the clavicle. They might pass into the axilla. The deeper portions burrowed and infiltrated among the fibres of muscles and the cellular planes of the neck. They probably arose from a rapidly growing lymphangioma. Spontaneous cure might occur through rupture of the cyst wall and rapid absorption of the contents. The larger the swelling, the more likely was it to disappear spontaneously.

Osteomyelitis of the Jaw.

Dr. Nelson also showed a boy, aged five weeks, who was admitted to hospital on March 1, 1932. One month earlier the infant had developed a submental abscess. The mother had a pustule on her breast. From the child's submental abscess pus subsequently discharged into the mouth. After the abscess was incised twice, the patient was transferred to the Renwick Hospital for Infants. At the time of the child's admission to hospital the right side of the face was much swollen and there was no discharge from the two incisions. The submental area was reopened at intervals and pieces of bone were removed from the mandible. Sequestra were still forming. The patient was being treated as an out-patient.

Laryngismus Stridulus.

DR. MILTON COUTTS showed a girl, aged seven weeks, who was admitted to hospital with a history that she held her breath and became blue and that she sometimes did this in her sleep. When the child was examined with the tongue spatula, she stopped breathing and became blue. Under general anaesthesia the epiglottis was seen to be very thin and limp, and to move to and fro through an angle of approximately 160° with inspiration and expiration. The larynx was otherwise normal in appearance and there was no evidence of stenosis or of muscular weakness. Dr. Coutts concluded that this was a typical case of laryngospasm or *laryngismus stridulus* and that the condition was probably due to sudden inhalation of the epiglottis.

Laryngeal Stridor.

Dr. Coutts also showed a boy, aged two years, who had cried normally for two or three weeks, but who then became husky and was "always a heavy breather". At the age of one year direct laryngoscopy under general anaesthesia revealed: (i) excessive folds of mucous membrane overlying the anterior two-thirds of the cords and meeting in the mid-line, suggesting prolapse of the ventricular mucosa; (ii) inability to close the glottis completely owing to paresis of the interarytenoid muscle; (iii) atonic fleshy pink cords, not the usual pearly white, tense, clear bands; (iv) non-abduction of the right cord on deep inspiration (paralysis of the posterior crico-arytenoid muscle). At the age of two years the right abductor paralysis had disappeared. There was still some interarytenoid weakness and the child was still unable to hold its breath.

An Obturator for Cleft Palate.

DR. W. J. WEARN showed plaster casts of various types for use in cases of cleft palate and demonstrated how his rubber obturator was applied. Two patients with plate *in situ* were bottle-fed during the demonstration, to illustrate the improved suction and simplicity of manipulation.

Meningococcal Meningitis.

DR. J. E. SHERWOOD showed a patient who had suffered from meningococcal meningitis. The cerebro-spinal fluid was turbid at the onset and a pure culture of meningococci had been grown. In this case, notwithstanding the small amount of anti-meningococcal serum administered, the child had made a perfect recovery and now, two years after the onset, did not show any stigmata of brain injury. Repeated lumbar punctures had been performed daily and large quantities of cerebro-spinal fluid, up to eighty cubic centimetres, had been withdrawn. The lumbar punctures were continued for a period extending over one month.

Rickets.

DR. KEITH CRAIG showed three patients who were suffering from rickets; two of the cases were of pronounced character and one of a milder degree. In each case the X ray examination revealed well marked changes in the bones.

Pink Disease.

DR. INGLIS ROBERTSON showed eleven patients who were suffering from pink disease. These showed various stages and manifestations of the condition. Included was a previous sufferer from the same complaint who was a brother of one of the present patients. This child had been under treatment for fourteen months in the hospital and had not lost some of the stigmata of the disease until some months after his discharge. He now appeared perfectly normal.

Milk and Infant Feeding.

DR. W. C. PETHERBRIDGE gave a demonstration of milk and of infant feeding. In the first place he showed a typical breast feeding equipment. This included a comfortable low chair, a low table, a breast-feeding tray and a clock. On the tray, which was designed to teach mothers the value of method and cleanliness, there was a tumbler of drinking water, a bowl of boiled water or weak boracic lotion, a bowl of swabs and a bowl for used swabs. There were scales of the balance or beam variety, and a case-taking scheme for difficult breast-feeding infants. The case-taking scheme was comprehensive, for failure to detect some trivial and easily remedied factor might lead to failure in breast feeding many times in succession. Dr. Petherbridge showed a typical test feeding report as furnished by a nurse, and also a report of fractional test feeding. He also showed a specimen calculation of the amount of complement to be added to a test feeding.

Dr. Petherbridge then discussed the basis of infant feeding. He referred to the frequent difficulties and errors associated with the selection of a good infants' food, particularly from the bacteriological aspect. He referred to some useful tests which were within the scope of any practitioner, but which were not intended to displace more accurate laboratory methods. He mentioned the appearance, smell and taste of samples of milk, the appearance of dirt seen through the bottom of the tumbler, the specific gravity and temperature of milk, the fat estimation, the acidity estimation, the reductase or methylene blue test for freshness *et cetera*.

Turning to the question of artificial feeding, Dr. Petherbridge discussed various feeding mixtures under several headings: humanized mixtures, the percentage composition of which resembled that of cow's milk; mixtures calculated by caloric estimation, percentage balance being placed in a secondary position; whole milk mixtures; acid milk feeding. He showed samples of each type. Dr. Petherbridge also discussed adjuncts to milk mixtures under the headings of carbohydrates and fats.

Cretinism.

DR. DONALD VICKERY showed three patients who were suffering from cretinism. The first child was aged two

months when first seen. It was a breast-fed child, but it was very difficult to make it take the breast. It had been listless and "jaundiced" since birth. It was extremely constipated and during the last few days prior to admission to hospital had taken "turns" which frightened the mother.

During the first week in hospital the child took several "turns" in which it became cyanosed, cold and almost pulseless. The rectal temperature during the first week did not reach 34° C. (95° F.) at any time. The child was very listless, very slow in its movements, very fallow and had coarse features. The skin was dry, and long dry hair with a fine down extended over the forehead and sides of the face. An umbilical hernia was present. There was a soft, blowy systolic murmur and a pulse rate of 160. The patient was given thyreoid extract 0.013 gramme (one-fifth of a grain) three times a day. Artificial heat was applied. The mother was given thyreoid extract 0.03 gramme (half a grain) three times a day. Now, after twelve weeks' treatment, the child's symptoms had all subsided. The colour was good. The skin was glossy and of good tone. The hair had disappeared from the forehead and sides of the face. The disposition was bright, the umbilical hernia was cured. The systolic murmur had disappeared. The pulse rate was 100 to 110 and the child was rapidly reaching a normal stage for age and was wholly breast fed.

The second child was brought at the age of five months. It had gradually gone off the breast because it would not suck; it was very listless and very constipated. Supra-clavicular swellings were present. The features were coarse and large deposits of subcutaneous fat were present on the limbs; the hair was long and dry; the skin was dry. The abdomen was protuberant. A soft systolic murmur was present. The child was treated with thyreoid extract 0.013 gramme (one-fifth of a grain) three times a day for three months and rapidly improved. Within one month constipation had disappeared; the child's disposition became bright; the skin became glossy and of good colour and tone. The mother then, of her own accord, resuspended treatment for six weeks and all symptoms of cretinism became rapidly reestablished. During the last year the treatment had been uninterrupted. The child was now twenty-one months old and was having thyreoid extract 0.03 gramme (half a grain) three times a day, and was walking, attempting to talk, and had lost its coarse features. It was bright and appeared to be rapidly approaching the normal. The improvement, however, was not so complete as in the first case.

The third child was aged eight months. It was breast fed and was first seen on the day of the meeting, having been sent for operation for umbilical hernia. The child exhibited all the symptoms of cretinism, was particularly coarse in features and slow in movement; it had a dry skin and hair and a dull disposition. The symptoms of listlessness and dulness were not quite so marked as in the first two cases, but evidently this child, who had had a continuous supply of breast milk, had received a small supply of thyreoid extract from the breast milk.

A Case for Diagnosis.

Dr. Vickery also showed a case for diagnosis. A baby, aged thirteen months, who had not been doing well, had for five weeks been pale and irritable. The chief feature of the baby was its disinclination to be handled; it resented being touched. The movement of the muscles of the neck shared in this hyperirritability. In addition, there was excessive sweating, hypotonia and a persistently rapid pulse of 150 to 170 per minute. There were no pink, puffy hands and no photophobia. The blood and cerebro-spinal fluid did not react to the Wassermann test. All tests of the cerebro-spinal fluid for tuberculous meningitis gave normal results. The von Pirquet test gave no reaction.

Dr. Vickery referred to the possibility of the case being one of scurvy-rickets, but there was no bleeding of the gums. X ray examination revealed only rarefaction of bone, such as is seen in malnutrition, and the glassy appearance was like that seen in pink disease babies. Also antirachitic and antiscorvy treatment for three weeks had caused no improvement. He stated that he was convinced that the case was a somewhat atypical one

of erythredema in which the pink hands and photophobia were not apparent symptoms. The last week the hands had become more typically pink, puffy, and had always been cold and clammy. The polyneuritic symptoms of erythredema seemed to be those most apparent.

NOMINATIONS AND ELECTIONS.

The undermentioned has applied for election as a member of the New South Wales Branch of the British Medical Association:

Bye, William Alick, M.B., Ch.M., 1923 (Univ. Sydney), Royal Prince Alfred Hospital, Camperdown.

The undermentioned have been elected members of the Victorian Branch of the British Medical Association:

Bartak, Percy, M.B., B.S., 1931 (Univ. Melbourne), 174, Alma Road, St. Kilda, S.2.

Griffiths, Leslie George, M.B., B.S., 1932 (Univ. Melbourne), Alfred Hospital, Prahran, S.1.

Ford, Edward, M.B., B.S., 1932 (Univ. Melbourne), 3, Moffatt Street, South Yarra, S.E.1.

Johnstone, James Walter, M.B., B.S., 1931 (Univ. Melbourne), Children's Hospital, Carlton, N.3.

Medical Societies.

THE MELBOURNE PÆDIATRIC SOCIETY.

A MEETING OF THE MELBOURNE PÆDIATRIC SOCIETY was held at the Children's Hospital, Carlton, on June 14, 1933. Dr. F. KINGSLEY NORRIS, the President, in the chair. The meeting took the form of a series of clinical demonstrations.

Traumatic Meningocele.

Dr. J. G. WHITAKER showed a baby of two years who had been knocked down in a street accident in January of this year. It was admitted one week later because of a swelling on the back of the head. This was regarded as a hematoma and after a few days the child was sent home, but one month later it was readmitted because the swelling was now definitely pulsatile. An X ray photograph of the skull at this time showed a linear vertical fracture in the left occipital bone, but no separation or depression of the fragments.

One month later the swelling had increased to about the size of a golf ball; it was pulsatile; it became much more tense on crying and much smaller during sleep. In fact, twice during sleep the swelling disappeared entirely. A second X ray photograph now revealed that there was a fairly wide separation of the fragments and the surrounding bone on each side showed a considerable area of rarefaction.

On aspiration of the swelling a thin, blood-stained fluid was withdrawn, which Dr. Webster thought was cerebro-spinal fluid. This almost certainly was so, because the swelling appeared again very quickly. On two subsequent aspirations it filled rapidly each time. The child was now quite well; there was no vomiting, the optic disks were normal, and neurological examination revealed no abnormality at all.

Dr. Whitaker thought that such conditions as blood cyst or *pachymeningitis hemorrhagica externa* were eliminated by the refilling after aspirations, and the cerebro-spinal fluid withdrawn. He could only assume that the *dura mater* was torn by the injury, thus giving a direct communication between the scalp and the sub-arachnoid space. This, of course, did not explain the condition at all, because after cerebral decompression a *hernia cerebri* occurred only if intracranial pressure were raised. There was no evidence of any intracranial pathological change or of raised pressure in this case.

He showed the case as an unusual complication of a head injury. As the child was so well and the condition stationary, he proposed to leave it alone for the present. Owing to the inelasticity of the *dura mater* it would be impossible to suture the torn ends. Later on he proposed to fill in the bony deficiency with a graft.

Hemichorea.

DR. MONA BLANCH showed a girl, aged seven years and ten months, with the history that seven months ago she pulled a drawer out of a cupboard and dropped it, and the parents noticed that thereafter she would drop many things and could not write because of tremor. However, the onset was probably not so sudden as this, because the schoolmaster noticed that the girl had had difficulty in writing for the previous two months because of tremor in the right arm.

She was a nervous, restless, highly-strung child, but apart from a few vague pains in the legs was otherwise quite well.

When first seen at the hospital four months ago she was regarded as suffering from chorea, was given salicylates and kept away from school. There was no reaction to the Wassermann test, a radiograph of the skull showed no abnormality, the heart was normal, and neurological examination revealed no abnormality at all. Her speech was normal, as were also her optic disks. There was no family history of rheumatism. At the time of the meeting the only abnormality was the tremor of the right arm with some purposeless movements, and occasional myoclonic spasm of the fingers. There was a very slight lateral nystagmus, equal on the two sides. The condition seemed to be slowly improving.

Dr. Blanch thought the diagnosis was chorea, although nine months was a long time for chorea to persist. It was obviously not functional, and choreiform movements due to an organic lesion of the brain did not become less, as they appeared to be doing in this case.

DR. M. L. POWELL agreed with the diagnosis of hemichorea. He said that any lesion near the red nucleus where the superior cerebellar peduncle ended would give rise to choreiform movements, and the conditions to be considered were chorea, encephalitis, cerebral tumour, and disseminated sclerosis. The absence of any history of a febrile illness and the improvement were against a diagnosis of encephalitis. The girl was too young to have disseminated sclerosis, in which disease also the earliest symptoms were usually transitory. There was no evidence of cerebral tumour. On the other hand, the girl held the outstretched hand in the typical choreic attitude, and there was the history of pains in the legs. Certainly nine months was a long duration for chorea, but apparently improvement was occurring and Dr. Powell thought the most probable diagnosis was hemichorea.

Tuberculous Cervical Adenitis.

DR. G. M. TALLENT showed a girl of two and a half years with a history of painless enlargement of the glands on each side of the neck, but more marked on the left side, for the past six months. There was no local sepsis to cause adenitis, there was no reaction to the Wassermann test, and on examination the blood was normal. There were no other enlarged glands elsewhere, and an X ray examination of the mediastinum revealed no abnormality. There was a marked reaction to the von Pirquet test with both human and bovine tuberculin. On this evidence the glands were regarded as tuberculous, and three weeks previously the tonsils had been enucleated. This had had no effect on the glands.

Dr. Tallent said he showed the patient for an opinion as to the best line of treatment to be adopted in similar cases. While some patients undoubtedly did well with conservative treatment, many glands broke down and led to chronic discharging sinuses with unsightly scarring, whereas early surgical intervention would in most cases avoid this. If conservative treatment were to be tried, it seemed essential to have complete rest in the recumbent position with heliotherapy and some form of fixation of the head.

DR. H. DOUGLAS STEPHENS said he thought that the best criterion was the age of the child, because under the age of three years there was a great risk of generalized tuberculosis following operative interference, particularly if it needed to be extensive, as in this case. He preferred to treat such patients conservatively by rest, heliotherapy and with cod liver oil till they gained in weight and then, but only then, to operate if the glands had not subsided. He drew attention to the red, dry, scaly appearance of the cheeks in these cases.

DR. J. KINGSLEY NORRIS remarked that Dr. Downes had gone into this question some years before, and his conclusion had been that, irrespective of age, it was best to treat all these patients conservatively for three months and that if the condition did not subside in that time, surgical removal gave unquestionably the best results.

Pyodermia.

DR. ROBERT SOUTHBY showed a baby of eleven months with the history that it had had a rash for ten months and trouble with the eyes for nine months. It was a full time baby weighing 4.9 kilograms (eleven pounds) at birth, and had been entirely breast fed.

It had gained in weight very slowly, so that at eight months it weighed only 7.8 kilograms (seventeen and a half pounds) and it then began to lose weight. On admission it weighed only 5.1 kilograms (eleven and a half pounds).

At the age of one month a rash appeared on the head, face, buttocks and legs. At the age of two months the eyes became inflamed and corneal ulceration developed, so that now the sight in the right eye was irreparably lost. An ulcerative stomatitis then developed and extensive ulceration of the buttocks and thighs. In these early months the child was treated in the country as suffering from an obstinate eczema. On the child's admission to the Children's Hospital the condition was first regarded as congenital syphilis, but when Dr. Southby saw it he disagreed with this for the following reasons. If the lesions were syphilitic it would imply marked activity and virulence, and the child would probably not have survived so long untreated. The spleen was not palpable. The eye condition was not characteristic and was too extensive. The gross atonicity also was not seen in congenital syphilis. The Wassermann test in the child's and both parents' serum was subsequently found to yield no reaction.

Dr. Southby showed the patient as possibly suffering from a severe degree of erythroderma. The atonicity, the extensive rash, the conjunctivitis and the ulcerative stomatitis were all fairly characteristic, and he thought that on this basis the more extensive skin lesions had developed.

DR. KATE CAMPBELL did not think the condition was erythroderma. The rash appeared too early and there was no sweating. The child was not irritable, nor were the hands and feet pink. She thought that probably the basal condition was simply malnutrition due to improper feeding and that the skin lesions were superadded infections. The age of onset also ruled out any question of avitaminosis.

NORTH COAST MEDICAL ASSOCIATION.

A MEETING OF THE NORTH COAST MEDICAL ASSOCIATION (Queensland) was held at Gympie on March 25, 1933, Dr. F. J. SHORT, the President, in the chair.

DR. ALEX P. MURPHY, President of the Queensland Branch of the British Medical Association, gave an enlightening address, illustrated by a series of skiagrams, on bronchiectasis. He stressed the point that in this part of the world, at any rate, bronchiectasis was the commonest cause of haemoptysis and pointed out that this fact and the uncertainty of diagnosis before the introduction of lipiodol had often caused cases of bronchiectasis to be diagnosed and treated as pulmonary tuberculosis.

DR. A. B. CUNNINGHAM and DR. J. J. STANLEY then presented two cases: (1) Spastic paraplegia in an amant, and

(ii) an example of *ectopia vesicae*. Dr. Cunningham showed a series of X ray films, taken with a portable machine, to demonstrate the help that the general practitioner can get from comparatively simple apparatus.

Dr. R. S. McGEEON demonstrated four cases of goitre which he had treated operatively. In the course of discussion the uses and abuses of iodine therapy were stressed.

Dr. W. L. MILLETT showed a case of *myositis ossificans*. He was followed by Dr. T. F. W. POWELL, who spoke of the efficacy of colonic irrigation of a solution of acriflavine in the treatment of a case of chronic colitis. Dr. Power also presented interesting notes on a case of acute intestinal obstruction in an aged woman.

Dr. L. M. OUTRIDGE demonstrated: (i) A hæmophilic in whom the treatment of dental caries had presented certain difficulties; (ii) a case of tumour of the vocal cord; and (iii) a case of trauma to a radius which years previously had been the seat of acute osteomyelitis. This case had caused an interesting problem in the workers' compensation jurisdiction.

After dinner, at which the Gynæcological members were the hosts to the visitors and members of the Association from other centres, Dr. LESLIE GIBSON, of Brisbane, read a thoughtful paper on "Internal Derangements of the Knee Joint", which provoked considerable discussion.

Dr. J. J. STANLEY concluded the clinical programme with a paper on "Blood Pressure".

Correspondence.

PAROXYSMAL TACHYCARDIA.

SIR: One often hears heart murmurs and irregularities which excite interest and speculation as to past pathogenic influences and future prospects and, unfortunately, even as to the present state of the heart.

A few notes of a case of paroxysmal tachycardia may be of interest in the journal, in so far as it demonstrated to me the origin and one possible termination of the condition.

A female patient, aged thirty-eight years, with symptoms pointing to epilepsy, and having rather infrequent major attacks at intervals of about four or five months, consulted me about her heart twelve months ago. She had been rejected from a friendly society owing to "leaking valve". At the time I noted nothing abnormal.

Recently I was called to see her at night and found her suffering from an attack of paroxysmal tachycardia.

The heart rate was 200 per minute, the patient looked well, was reclining in bed, but felt some distress in the præcordium and complained of pain in both sides of the neck and both jaws. Systolic venous pulse was seen in the neck with an accentuated systolic thrill. The apex beat was lost and replaced by a diffuse heaving of the præcordium. As the attack had been present only about half an hour, no cardiac enlargement of moment would be expected.

The interest to me of this demonstration was that the heart resumed its former, not normal, rhythm while I was auscultating the heart. Immediately before I had tried pressure on the eyeballs and pressure of the vagal nerves in the neck in turn and whilst I was listening to the heart, the patient complained of a pain running, as she described it, up the sides of the neck to the vertex of the head; coincidentally with this, the heart rate became 80 per minute and the pain disappeared.

The rhythm of the heart was now irregular, having presystolic contractions which were at first rather irregular, but which quickly settled into a 1:3 rhythm, perhaps a *pulsus trigeminus*; at this stage I left the patient.

This case suggests the sudden flood of extrasystoles that must rather suddenly appear in a heart in which they are previously present in a more restrained fashion; and

the sorting out and combination of these impulses to give a synchronous auriculo-ventricular systole and a new rhythm based on extra systoles.

Rather loose usage of the terms presystolic and extrasystolic has been made in this note.

Yours, etc.,

H. V. GILLIES.

Barraba,
New South Wales,
May 21, 1933.

THE PROBLEM OF GASTRIC CARCINOMA.

SIR: Since your correspondent "Pathologist" quotes *The British Medical Journal* as an authority, one might logically inquire how it is that he is not familiar with an article in the issue of April 23, 1927, on "Testing for Occult Blood in Faeces (A Study of Alleged Fallacies)", by Dr. A. G. OGILVIE, of the Pathological Department, Royal Victoria Infirmary, Newcastle-on-Tyne, in which the important conclusion was reached that "a blue or blue-green colour with Gregersen's test, obtained before thirty seconds, is proof positive of the presence of occult blood in the stools, irrespective of the patient's diet".

It must, therefore, follow that not only are "Pathologist's" views with reference to a preliminary diet (free from hæmoglobin and chlorophyll) obsolete, but, since Dr. A. Abrahams demonstrated in 1920 that it is necessary for such a diet to include at least one cubic centimetre of blood for a positive reaction to be recorded, his negative readings will thereby be rendered unreliable.

To avoid a repetition of the unseemly and indecent disinterment of this boggy of hæmoglobin-free and chlorophyll-free diet, by correspondents who seek self-effacement by *noms de plume*, may I recommend your readers to peruse the original article of Dr. Ogilvie from which I append an account of Gregersen's Test?

Powders are made up containing 0.2 gram of barium peroxide and 0.025 gram of pure benzidine; if put up in wax papers they will keep indefinitely. Just before the test one powder is dissolved in five cubic centimetres of a freshly prepared solution (fifty per cent.) of acetic acid. A "button" of faeces is taken by means of a clean glass rod from the centre of the stool; it is important to take it from the centre, as no risk of contamination in the lower bowel—as from hæmorrhoids—must be run.

This portion of faeces is smeared on to a clean glass slide, and a few drops of the solution run on to the smear. A blue or blue-green colour develops within a minute if the test is positive, and the reaction is graded according to the depth of the colour and the time it takes to develop.

Gregersen recognises three grades: +, a pale blue or green colour within sixty seconds; ++, a definite pale blue in twelve to fifteen seconds; +++, a deep blue within three seconds. These grades should be adhered to except that a blue-green colour developing after thirty seconds should be labelled "Faint +" and regarded with suspicion.

Yours, etc.,

H. RUTHERFORD DARLING.

229, Macquarie Street,
Sydney,
July 14, 1933.

ANÆSTHESIA WITH PRENARCOSIS BY MORPHINE AND PARALDEHYDE.

SIR: The valuable article on prenarcois by morphine and paraldehyde, by Drs. Garrett and Gutteridge, which appeared in your journal of July 8, 1933, prompts me to write of the use of paraldehyde in prenarcois in children.

For some years this method has been in use as a routine in tonsillectomy at the Great Ormond Street Hospital for Children, London, and the results have been consistently satisfactory.

The dose used is one drachm of paraldehyde (which must be fresh and have been kept in a cool, dark place) to each stone of the child's weight. One part of paraldehyde (warmed) is mixed with eleven parts of warm normal saline and the mixture is given slowly into the rectum one and a half to two hours before operation, the tube being allowed to stay in until the child is asleep. It is to be noted that saline is used in preference to olive oil as a diluent. Morphia is avoided, but atropine is given one hour before operation (grain one two-hundredth to one year and grain one one-hundredth after one year). The children come into the theatre sleeping quietly. A few drops of ethyl chloride and then open ether give an unbroken anaesthesia. They sleep on afterwards and have no memory of the theatre or operation. I was told that only 1% vomit.

It might be argued that the giving of the paraldehyde would cause more fuss and bother than the anaesthetic itself. In actual practice this is not so, and surprisingly little difficulty is encountered, provided that a soft tube is used and the mixture given slowly and at the correct temperature. Again, it is sometimes postulated that paraldehyde may irritate the bowel. Personally, I have not seen this occur and it was not commented on at Great Ormond Street.

The advantages are obvious. One avoids the psychic trauma which is so often inflicted on children when they struggle violently against an anaesthetic. The children sleep on after the operation and when they awaken are more comfortable than after an ordinary anaesthetic. Because of the absence of struggling, and the small amount of anaesthetic used, this form of anaesthesia is particularly safe.

For intrapulmonary lipiodol injections in children a prenarcois with paraldehyde allows one to use the crico-thyroid route with a small amount of local anaesthetic and with the use of no, or only at most a very small amount of, general anaesthetic. This makes the procedure simpler and very much safer.

Yours, etc.,

DOUGLAS GALBRAITH, M.D.

Melbourne,
July 18, 1933.

PATHOLOGICAL CONDITIONS OF THE CERVIX UTERI: TOTAL OR SUBTOTAL HYSTERECTOMY.

SIR: Dr. Worrall has commented upon the remarks in my paper (published June 3) anent total hysterectomy. One does not claim any discovery regarding the disadvantages of subtotal hysterectomies, but one might wish to point out very obvious facts which have only recently had statistical support, concerning the occurrence of carcinoma in the cervical stump, this invasion occurring in an appreciable number of subtotal hysterectomies.

The Worrall operation has many advantages; amongst others, it provides that the gland area of the cervix be removed and the vaginal discharge (which is frequently so irksome to the patient) does not occur, as it often does in the subtotal cases. Further, the ligaments and supports of the vaginal vault are retained by the Worrall operation, and this is a matter of considerable moment. This type of effect, however, is also found in the enucleation operation of Schlink, while the latter has the advantage that the surgeon may simultaneously attend to the cervical lacerations which may, at least in part, be missed by the Worrall method.

It is from these lacerations that the carcinogenesis originates, and they should not be left as a menace for future years; unless I misunderstand the Worrall operation, these lacerations are not always excised.

With regard to the treatment of cervixes by diathermy coagulation, or by cauterization, there are two remarks which might indicate their place in gynecological treatment. Firstly, the more simple types of erosion respond very effectively to this treatment without operation, as the patient understands it, and no anaesthetic is required; and the cessation of the annoying discharge is a great comfort to the patient. Secondly, there appears to be no report in

the literature concerning the development of carcinoma in cauterized or coagulated cervixes, despite the large number of cases which have been recorded during the past eight years.

The Worrall operation (as I understand the technique) has earned the praise of many gynecologists and, except in the widely lacerated cervixes, is an operation which, in suitable hands, should yield excellent results.

Yours, etc.,

R. FRANCIS MATTERS.

North Terrace,
Adelaide,
July 18, 1933.

THE SALARY OF RESIDENT MEDICAL OFFICERS.

SIR: This letter is not written as a complaint, but as an explanation. The general impression amongst the medical profession is that the junior resident medical officers at the Coast Hospital are highly paid, compared with those of other institutions. This is undesirable from the point of the hospital, the medical staff and those who contemplate seeking a position as a resident.

The nominal salary of a junior resident is £339 16s. 0d. This is reduced as follows:

Public Service Reduction	£54 10s. 0d.
Maintenance, 'phone and laundry ..	£65 0s. 0d.
Wage Tax (based on £285 6s. 0d.) ..	£14 5s. 0d.

In addition, the mess bill amounts to approximately £1 per week. This leaves an actual salary of £153 15s. 0d. When it is considered that the residents must be at least of one year's standing, this is the lowest salary paid in any general hospital in New South Wales. The salaries of the senior residents are proportionately low.

We feel justified, then, in correcting the existing false impression.

Yours, etc.,

THE RESIDENT MEDICAL OFFICERS,
COAST HOSPITAL.

Little Bay,
New South Wales,
July 21, 1933.

EARLY PULMONARY TUBERCULOSIS.

SIR: In your issue of July 22, Dr. Newing rightly describes Dr. Darcy Cowan's article in THE MEDICAL JOURNAL OF AUSTRALIA, of June 24, as "splendid": but, unfortunately, he goes on to say "it is not possible to make a positive diagnosis until quite considerable pathological changes have taken place".

Surely he overlooks an essential feature of Dr. Cowan's paper, namely, that by test injections of tuberculin, we can make a diagnosis at a really early stage, even before the development of lesions discoverable by clinical examination or X rays.

"Nothing can take the place of tuberculin in the early diagnosis of phthisis." Treatment, when the disease is obvious, may do good, often much good; complete success is attainable only in the early stage.

Yours, etc.,

GUY GRIFFITHS, M.D.

131, Macquarie Street,
Sydney,
July 25, 1933.

MEDICAL BENEVOLENCE.

SIR: I am prompted to make this communication by reason of there being brought to my notice a very deserving case of distress among the dependants of a medical man who had fallen by the financial wayside through no fault or misconduct of his own, but through sheer misfortune.

On making inquiries as to what assistance might be given by the New South Wales Medical Benevolent Association, I was surprised to find how limited its funds were

and how few life members and regular subscribers there were, considering the number in the profession in the State. The funds at its disposal are disbursed carefully and wisely to the considerable number of dependants who are in need of help. The medical profession is jealous of its reputation for charity, not only evidenced by the enormous amount of work it does for no reward, and knowing beforehand it will get no reward, but in direct financial subscriptions to charities.

I feel sure that the apparent neglect of its own medical benevolent charity is due to not having it brought under notice insistently and frequently enough, such as is done by the usual public charities.

I feel that the lack of funds in the New South Wales Medical Benevolent Association is also present in the similar organizations that exist in all the States.

Practitioners desirous of sending donations could send them to the Honorary Secretary of the fund, care of the Branch of the British Medical Association in which they reside, and ask for them to be given to the benevolent fund.

Yours, etc.,

Sydney,
August 4, 1933.

T. W. LIPSCOMB.

THE TONSIL PROBLEM.

SIR: Dr. Murphy could not have followed my line of argument. Everyone agrees that the large majority of tonsillectomies are followed by apparent cure. Patient investigators have shown that this is only temporary and that in a few years the number of cases of sinusitis is greater in those operated upon. In the last fortnight I have seen six children with perfect tonsillectomies (from two to four years ago) with gross sinusitis.

Yours, etc.,

W. KENT HUGHES.

22, Collins Street,
Melbourne,
July 31, 1933.

ADHESIONS IN THE UPPER PART OF THE ABDOMEN.

SIR: Reading your "Current Comment" on abdominal adhesions prompts me to quote the following case I have watched over a period of twenty years.

Mr. S.P., aged thirty-six, began to get obscure abdominal pains with hyperacidity. He was working intensely at the time. There was tenderness in the region of the duodenum and driving in the car over rough roads always aggravated the condition. He carried on for a year or more until he was compelled to go to hospital. This resulted in some temporary improvement, but the condition got much worse again. It was decided to explore, as there was occult blood constantly in the faeces. The operation revealed many adhesions round the gall-bladder and duodenum, but no deep ulcer was found. The adhesions were broken down and the appendix was removed. Convalescence was very slow, and the abdominal pains soon returned. He had five dead teeth, which showed no signs of infection at the roots. These he decided to have out, in spite of the appearance of the films, and was rewarded by a return to health and freedom from pains. For a year or two all went well, when the old symptoms returned. The gums had been carefully watched for signs of infection, and one or two small pockets were detected round the upper molars, though to all appearances they showed no signs of infection. On the strength of this the upper teeth were removed and again there was a period of good health for several years. Again the old symptoms began to appear, and although the lower teeth looked quite all right, cultures were taken from between the teeth and a hemolytic streptococcus was isolated. This, amongst others, was incubated in the patient's own blood. This survived, the others being killed out. On the strength of this the lower teeth were extracted. There was then a long spell of

freedom from discomfort, except for occasional trouble due to lifting heavy weights or violent exertion, probably rupturing some small adhesion or other, until about ten months ago, when an antrum flared up and the old symptoms returned, but this time there was evidence of an ulcer at the cardiac end of the stomach, with a good deal of occult blood in the stools. To add to the trouble, signs of bowel obstruction developed with severe prostration, the slightest exertion causing the most intense fatigue. The X rays revealed an obstruction where the duodenum crosses the spine. The meal would rapidly reach there and be quickly shot back into the stomach again. Food taken in the middle of the day would often have to be ejected before going to bed on account of discomfort. Complete rest with very small feeds every two hours, with the aid of mixed alkaline powder, gradually brought some relief. Most of the pain was referred to the shoulder and down the arm, especially the thumb. Any position except flat on the back would bring on the pain, which even after nine months is still present. The toxic action of absorption of partially digested proteins was extremely marked. Belladonna was used in full doses to relax any spastic condition that might be produced. Improvement gradually developed, pain became less, and the food got away easier, though great care had to be exercised in avoiding too much at a time. At the present, as long as reasonable care is taken, life is fairly satisfactory, but any undue exertion will quickly bring back the old symptoms. The antrum was ionized soon after the symptoms got bad, and has given no trouble since. This and many other cases have convinced me that in infected gall-bladders, ulcers and many cases of appendicitis the organisms are carried in the blood stream from some focus and are deposited in the area of the ulcer *et cetera*. They are not all deposited in the actual ulcer itself, but in the neighbouring peritoneum, which is exactly what one would expect, and that it is these that set up localized peritonitis and cause adhesions. The peritoneal symptoms are very distinct, as, as soon as the infection is cut off, all pain goes, and unless there is obstruction no symptoms of dysfunction occur. I have on various occasions seen painful adhesions following appendicectomy quickly clear up on removal of infected tonsils *et cetera*. There is no doubt that a lot of absorption takes place, especially when diathermy is used.

Yours, etc.,

12, Collins Street,
Melbourne,
August 3, 1933.

SYDNEY PERN.

THE LISTERIAN ORATION.

SIR: I wish to say at the very outset that I am privileged to number Dr. Maguire among my friends, and the only reason why I am writing this is to point out to him that he has been guilty of *lèse-majesté* in neglecting to pay proper homage to the man who, as Dante said of Homer, "*Sopra gli altri, com'aquila, vola*"; and that "eagle" that soars above the others is Lawson Tait, of whom William Mayo has written: "The cavities of the body were a sealed book until the father of modern abdominal surgery, Lawson Tait, and our own Joseph Price carried the sense of sight into the abdominal cavity." This same Joseph Price has himself declared: "In pelvic surgery Tait stood first and taught the best we know." But what does Dr. Maguire say? I shall relate in due course.

That Dr. Maguire does not appear to possess that intimate historical knowledge which a German would demand when tracing what he would delight in calling the *Entwicklungsgeschichte* (history of the development) of modern gynaecology, becomes very evident when we find that he wastes space in quoting the drivel of Henry Bennet, and is content to neglect the classic work of Bernutz and Goupil, the one and only work that sets forth the truth, based on material derived from the dead house, concerning the pathology of pelvic inflammation, including salpingitis; work which after a period was fully confirmed by Lawson Tait as the result of his advance into the pelvis to attack these conditions on the operating

table, and thus lay the foundation for the pathology of the pelvis in the living. He was the first to begin those operations on the tubes and ovaries that are done today in every hospital in the world.

Let me at this stage not appear to be picky, but I would like to direct Dr. Maguire's attention to the fact that he has added an extra "t" to Bennet, and has robbed Goupil of his only "eye" and has given him a couple of vowels in compensation; and so Goupil is transformed into Goupal.

But while the Orator has been liberal with his vowels, he has been niggard with his references to three men whose names one loves to juggle with in dealing with the history of modern gynaecology, and those three men are Sims, Schroeder, and Lawson Tait; in fact, he does not even deign to notice the first two and brushes by the third.

Now Dr. Maguire may not realize that Marion Sims is the founder of modern gynaecology. He lived in a little up-country town away among a negro and wayback population, and he decided to put up a little private hospital, but it was so unpretentious that the village folk called it his hen-roost. But in that small hut he shaped his speculum, made by bending two spoons and then binding the handles together. With the introduction of that speculum into the vagina of a negress he got a clear view of a vesico-vaginal fistula which he set to and mended with a metal suture, and modern gynaecology was born! From that little hut he went out to spread the glad tidings, and the time came when he had the medical world of London and Paris at his feet and got enormous fees for operating.

And what of Schroeder? I have always maintained that abdominal surgery started when Tait realized that he could tie a pedicle and let it drop back into the peritoneal cavity and then close the abdominal wound completely. But for some reason all operators for years made a mess of the stump left after a hysterectomy, and the first surgeon to clearly realize that the stump could be returned just like the pedicle of an ovarian cyst, provided that the uterine arteries were first secured, was Schroeder. He carried his idea into practice and conquered; but it took a long time for others to learn the lesson, and then Treves urged, and Melton, of Cairo, Stimson, Baer and Pryor, of America, perfected the new clean technique, and when Pryor died Howard Kelly married his widowed operation and put his own name to it and then published his "Operative Gynaecology", and then all was as easy as falling off a log, because the ingenuity of Trendelenburg gave us his new position and enabled the aseptic technique to be carried out by the biggest muffs in the profession. I regard the advent of rubber gloves, the large sponges that could be boiled, and the Trendelenburg position as among the biggest aids to pelvic surgery, and all tending to reduce the risks of infection, which is the main object of Listerism.

And now I come to that part of the oration that really did get my shirt out, if, indeed, I may be permitted to use such unadorned vernacular.

Dr. Maguire tells us that Spencer Wells was so and so. Let us test his opinion, which I shall quote presently, by seeing what the operation for the removal of ovarian cysts tells us. Wells knew nothing about the appendages, and on a memorable occasion put his foot into it properly when he scoffingly remarked at a meeting in London that he had never seen a diseased Fallopian tube, "as all such cases had evidently gone to Birmingham". Year after year Tait exhibited pyosalpinx after pyosalpinx until Spencer Wells must have been driven demented. Spencer Wells's records are truly shocking, for at the conclusion of his first 500 cases of ovariectomy he recorded 127 deaths, that is, 25%. In 1877 he resigned from the Samaritan Hospital and he published his results, which show that in twenty years he had performed ovariectomy 408 times with 99 deaths; that is to say, his mortality for the whole series was 24%. Spencer Wells in fact left ovariectomy mortality where it had been for half a century before him: a mortality of one in four. In spite of this, Dr. Maguire tells us that: "His work was very sound and he became widely known as a safe operator." Now I am pretty certain that if Dr. Maguire himself had to have

an abdominal section and he learnt that the surgeon was a "safe" operator, having not more than one death in every four, that he would probably take the first aeroplane and come to Lismore to find something a little safer.

And yet be it known that while Spencer Wells went on regularly killing his twenty-five per hundred, men like the elder Keith and Tait were operating with only a mortality of 3%, Tait actually doing one series of 139 consecutive ovariectomies without a death. Neither of these men followed Lister's technique; in fact, Lister actually advised abdominal surgeons not to use his technique, for he doubted whether it could be trusted when dealing with the peritoneal cavity. However, some did use it and found it answered well, but Tait's aseptic technique soon got the upper hand, and it has held its own ever since. I don't for one moment defend Tait's treatment of Lister. I regard Lister as the greatest benefactor the world has ever known, and I declare that Tait's aseptic technique was the highest form of Listerism, for it dropped all the absurd steps, such as the spray and the use of carbolic, and employed other methods to bring about sterility; but it was only a variant of Lister's principle. I am glad to say that when I published Tait's "Life", Clifford Allbutt wrote to me and congratulated me for condemning the way that Tait had treated Lister.

But to return to Dr. Maguire's oration, one would have thought that he would have devoted at least a column to Tait. Not a bit of it; this is all he says: "Lawson Tait settled in Birmingham in 1871. He was a great opponent of Lister, but at the same time he used boiled or warm water to wash out the abdomen, and used simple cleanliness in all his work." Faint praise for the founder of abdominal surgery!

In the old days in Dublin when an opera singer did not sing his song satisfactorily the gallery were wont to stop the play, and then one of the mob sang the song properly. Let me act for the gallery, and I will sing the deeds of the founders of abdominal surgery which is joined with gynaecology.

(a) Tait was the first surgeon to understand the meaning of pelvic inflammation and to operate successfully on pyosalpinx. Hegar operated at the same time, but lost his patient.

(b) Tait was the first surgeon to operate on collections of pus in the broad ligaments by opening the abdomen, refusing to take less risk by the easier and apparently safer vaginal route.

(c) Tait was the first surgeon to operate for ruptured ectopic pregnancy, and he founded that branch of operative gynaecology. Is not that worthy of mention?

(d) Tait was the founder of gall-stone surgery, and not even Moynihan dare again try to steal the honour for Langenbeck. The noble lord has learnt his lesson, and at Birmingham not so long ago reminded the citizens that "their Lawson Tait was one of the immortals".

(e) Tait was the first surgeon in Great Britain to operate on hydatid cyst of the liver and cysts of the urachus.

(f) Tait was the first surgeon to pour quarts of boiled water into the abdominal cavity to wash out blood clot or to try to prevent or lessen sepsis after contamination of the abdominal contents.

And now, having vindicated the good name of my dead master, I hope I have convinced my friend the Orator that he committed a grave error in not putting Tait in the foreground, just behind Lister. And before I end this already too long screed, I would like to point out that many seem to forget that Listerian principles are for prophylaxis and that in the face of diffuse general peritonitis they avail us nothing, but Tait's wash-out may help a little. It does, indeed, seem humiliating when we strut about like second-hand peacocks and know that though some of us can boast of our thousands of sections, yet face to face with diffuse general peritonitis we cut a sorry figure, for we have made no certain advances to conquer that condition in the last fifty years.

Yours, etc.,

Lismore,
New South Wales,
Undated.
W. J. STEWART MCKAY.

Obituary.

GERALD SEPTIMUS SAMUELSON.

WE regret to announce the death of Dr. Gerald Septimus Samuelson, which occurred on August 7, 1933, at Sydney, New South Wales.

Medical Appointments.

Dr. R. W. Gibson has been appointed Quarantine Officer, Thewmard, South Australia, pursuant to the provisions of the *Quarantine Act, 1908-1924*.

Dr. B. H. Morris (B.M.A.), Dr. S. R. Burston (B.M.A.) and Dr. K. McEwin (B.M.A.) have been appointed members of the Nurses' Board of South Australia, under the provisions of the *Nurses' Registration Act, 1920*.

Dr. A. B. P. Amies (B.M.A.) has been appointed a member of the Dental Board of Victoria, pursuant to the provisions of Section 38 of the *Medical Act, 1928*.

Dr. A. Bean (B.M.A.) has been appointed Medical Officer of Health by the Fremantle District Road Board, Western Australia.

Dr. A. B. Swain has been appointed a Certifying Medical Practitioner at Trafalgar, Victoria, pursuant to the provisions of the *Workers' Compensation Act, 1928*.

Dr. N. R. Paterson (B.M.A.) has been appointed Government Medical Officer at Woodstock, New South Wales.

Dr. W. B. Stephens (B.M.A.) has been appointed Certifying Medical Practitioner and also Medical Referee at McKinnon, Victoria, pursuant to the provisions of the *Workers' Compensation Act, 1928*.

The undermentioned have been reappointed to the staff of the Adelaide Hospital, South Australia: Honorary Gynaecologist, Dr. R. E. Magarey (B.M.A.); Honorary Physician, Dr. D'A. R. W. Cowan (B.M.A.) and Dr. C. T. C. de Crespigny (B.M.A.); Honorary Radiologist, Dr. H. C. Nott (B.M.A.); Honorary Assistant Aural Surgeon, Dr. R. McM. Glynn (B.M.A.); Honorary Assistant Pathologist, Dr. H. W. Wunderly (B.M.A.) and Dr. A. F. Hobbs (B.M.A.); Honorary Assistant Physician and Curator, Medical Section, Dr. F. H. Beare (B.M.A.); Honorary Consulting Anatomist, Professor H. J. Wilkinson; Honorary Clinical Physiologist, Professor C. S. Hicks; Honorary Anaesthetist, Dr. A. D. Lamphree (B.M.A.); Honorary Curator, Gynaecological and Obstetric Section, Dr. B. H. Swift (B.M.A.); Honorary Assistant to Officer in Charge of Electrocardiograph, Dr. E. F. Gartrell (B.M.A.); Honorary Dermatologist, Dr. F. H. Makin (B.M.A.).

Dr. A. A. Palmer (B.M.A.) has been appointed a member of the Dental Board of New South Wales.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, locum tenentes sought, etc., see "Advertiser", page xiv.

ADELAIDE HOSPITAL, ADELAIDE, SOUTH AUSTRALIA: Honorary Ophthalmologists.

HOBART PUBLIC HOSPITAL, HOBART, TASMANIA: Resident Medical Officers.

LAUNCESTON PUBLIC HOSPITAL, LAUNCESTON, TASMANIA: Resident Medical Officers.

MANEBA BABIES' HOSPITAL, SOUTH AUSTRALIA: Resident Medical Officer.

ROYAL HOSPITAL FOR WOMEN, PADDINGTON, SYDNEY, NEW SOUTH WALES: Junior Resident Medical Officer.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phoenix Mutual Provident Society.
	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	Brisbane Associated Friendly Societies' Medical Institute. Chillagoe Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL, are advised, in their own interests, to submit a copy of their agreement to the Council before signing. Lower Burdekin District Hospital, Ayr.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Combined Friendly Societies, Clarendon and Kangarilla districts. All Lodge Appointments in South Australia. All Contract Practice Appointments in South Australia.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Contract Practice Appointments in Western Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	Friendly Society Lodges, Wellington, New Zealand.
NEW ZEALAND (Wellington Division): Honorary Secretary, Wellington.	

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to "The Editor", THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

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